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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

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DESIGN VALUE OF DECORATIVE MOTIFS

A Series of Articles on This Interesting Subject Has Been Prepared by the Author with the Object in View of Giving the Student Craftsman in Art Metal Work a Comprehensive Idea of the Design Value of Decorative Motifs, Their Characteristics Peculiar to the Particular Period or Style in Which They Appear and So Far as Possible to Explain Their Origin, Symbolic Significance and Decorative Value. It Is the Author's Sincere Hope That the Series Will Fulfill the Purpose for Which It Has Been Prepared—Fifth Paper.

Written for The Metal Industry by A. F. Saunders, Designer Benedict Manufacturing Company, East Syracuse, N. Y.

One can hardly treat in a comprehensive manner the subject of Design Value of Decorative Motifs, without touching even though lightly, upon the necessary co-relationship that should exist between the outline or form, its proportions, decorative elements and the use for which the object is intended to serve.

A single ornamental motif in itself possesses no particular decorative value, it fulfills its purpose only when placed in a relative position of complete harmony with the other elements of a composition forming a design as a whole, it must show a logical reason for its use and add aesthetically something of beauty and of charm. It

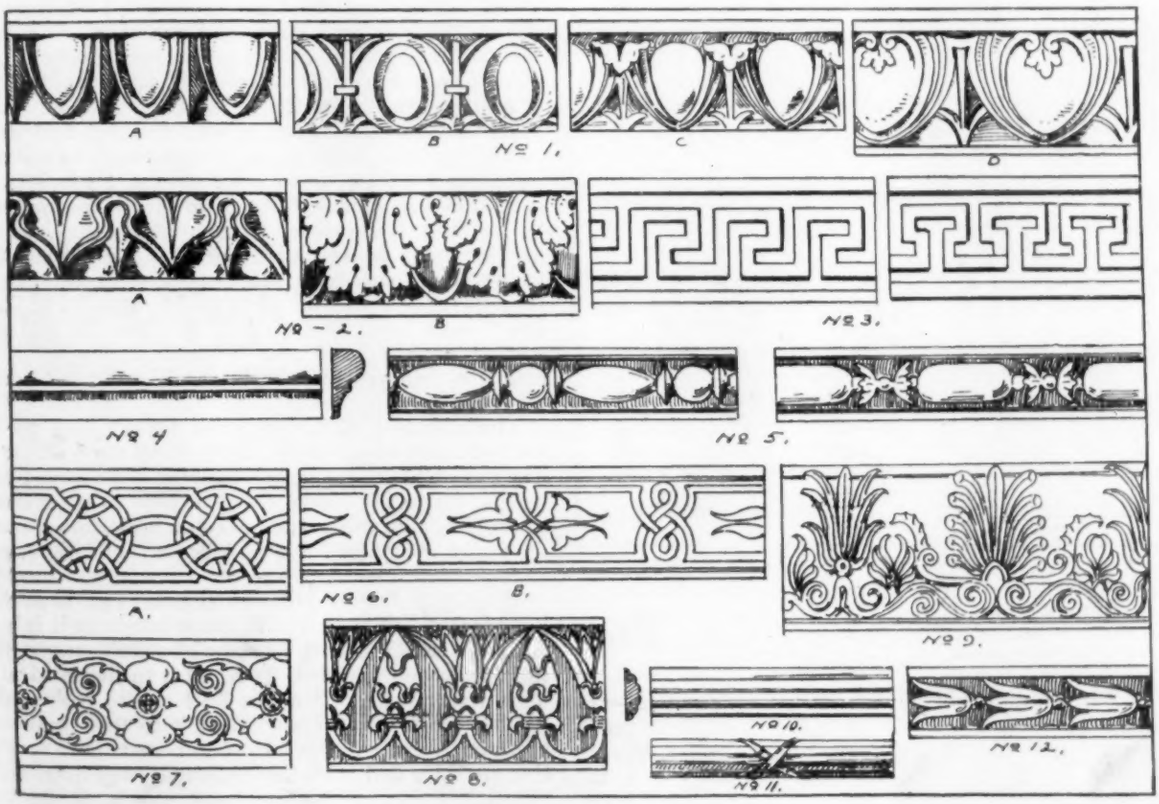

PLATE 10,

BANDS OR BORDERS.

No. 1, Egg and Dart Band; A—Greek, B—Roman, C—Renaissance, D—Modern French. No. 2, Leaf and Tongue Band; A—Greek, B—Roman. No. 3, Greek Key and Fret, or Meander Border. No. 4, Ogg Moulding, Gothic. No. 5, Greek Astragal or Bead Moulding Enrichment. No. 6, Interlacement Band; A—Romanesque, B—Modern. No. 7, Rosette Band, Islam, Carved Border. No. 8, Link Border, Assyrian Bas-relief. No. 9, Palmette Band, Greek. No. 10, Reed Band. No. 11, Reed and Ribbon, Enrichment. No. 12, Husk or Vertebrate Band, Greek.

is well to remember, however, that all beauty does not begin and end with the decoration, for if an object is poor in outline or badly proportioned, all the ornament in the world will fail to cover up the defects. Neither will the decoration contribute one iota of beauty if used merely as an embellishment to attract the eye or in any way interferes with the utility of the object it may adorn. There is no excuse for an article designed solely to become an object of ornament, everything we create should have some useful purpose. Utility and beauty are perfectly compatible, and there is no good reason why the possession of one should condone the lack of the other.

One might safely say that beauty should be divided into three classes, each bearing the closest relationship to the other. The first, beauty of form; second, beauty of ornament; third, beauty of service. To more clearly impress upon one's mind the importance of this co-relationship in design we may almost term this trinity the triangle of successful designing. The decorative elements of a design must be considered at the very start. They form a concrete part of the conception at the time of its inspiration, by this I mean a general idea of the decorative features of the design must develop (not detail) with the form and purpose of the object conceived, and not as a separate element to be thought out and applied later on. In judging design we first look to the outline or form, then its decoration, there must be perfect unity between the two attained only by developing as a complete design

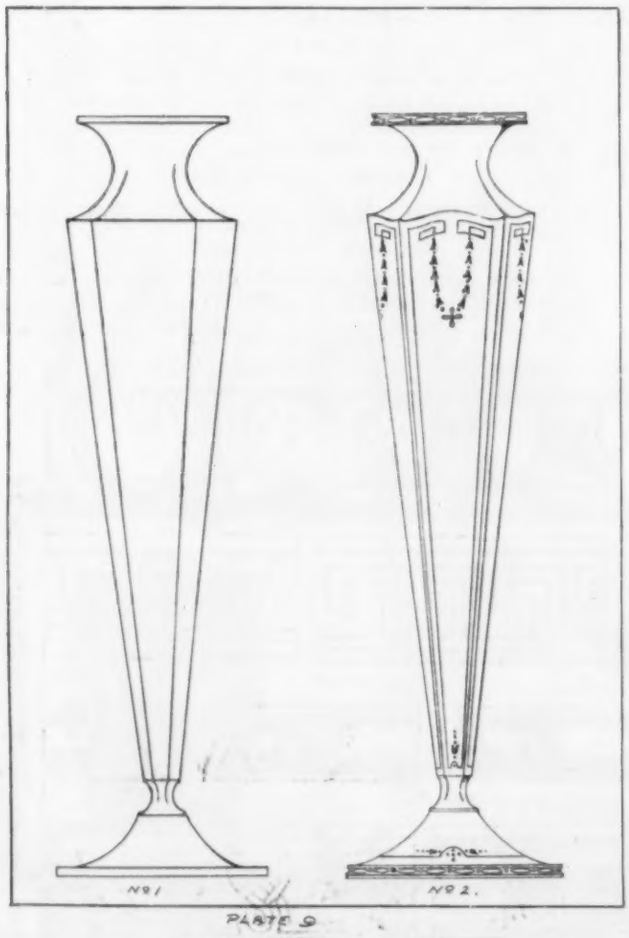

PLATE 9

THE VALUE OF DECORATION.
PLAIN FORM. FORM DECORATED.
The structural lines suggest the type of decoration. The proportions determine amount and location of decorative units.

the proper style of ornament, proportions, correct amount and spacing, these are all factors entering into the composition as a whole. The decorative motifs used and the particular processes employed in executing the design in its final form are the details. To better illustrate the value and necessity of close relation between these various elements, let us consult Plate 9, designed as a suggestion for a silver vase. No. 1 illustrates the outlined form only. The hexagonal fluted effect of this particular piece is perhaps pleasing in its very symplicity of outline, but after the first glance does it not become monotonous and appear to lack something? Its severely plain surfaces seem to demand some ornament to relieve them, what kind of ornament does it need? Its structural lines and general proportions suggest that. Now consult No. 2, note how the converging lines of the fluted body are strengthened by the use of parallel lines terminating at the top with a simple scroll and husk festoon effect in flat chasing. The severely straight line at the junction point of the neck and body is changed into a graceful undulating double line and the lip and bottom edge of the neck and base are relieved and strengthened by the addition of a simple beading. The plainness of the base is also relieved by the husk and rosette effect, the whole design has taken on a new touch of interest and assumes a finished appearance by the judicious application or rather incorporation of decorative features. This particular design of a vase brings us down to the value of decorative bands or borders. Under the general heading of ornamental forms, Bands or Borders, are grouped by themselves. They include those ornamental elements which are used to give expression to ideas of bordering, framing and connecting. The motifs are partly geometrical, partly plant forms and in rare cases artificial forms.

The proper application of the band form of ornament to metal work, covers its use as a finishing and strengthening edge to a large class of wares such as the rims of plates and dishes, or to separate the ground from the rim, to enclose panel effects, or to give a decorative finish to an otherwise raw edge such as the top and lip of pitchers, or the rim of a bowl. The principal band ornaments favored by the Greeks were the "egg and dart," Fig. 1, Plate 10; "leaf and tongue," Fig. 2, Plate 10; "Greek key" or fret, Fig. 3, Plate 10, and a large variety of interlaced and foliated motifs such as the palmette, honeysuckle, the lily and leaver and scrolls of many kinds.

The egg and dart, Ogee and Ovolo, also the Reed, are not really bands at all, in the strict sense of the word. They express the mediation between the support and the weight for which reason they are used as the enrichment of moldings in architecture; but as a matter of fact they do make very admirable and beautiful borders, and as such are much used.

The Greek fret or Meander border is perhaps the best known motif of any. As its name indicates it is a specifically Greek ornament, perhaps of textile origin, though this is an open question, its likeness to that ancient talisman, the "Swastika," might lead one to believe therein lay its true origin. I attributed it to this source in the first paper of the series. However we admire its decorative qualities and with the "Astragal" bead, "Husk" and "Ogee," form the leading band motifs in the several revivals of the classic period of ornament. The "Ogee," Fig. 4, Plate 10, is formed of a double curve like the letter S, the top convex, the bottom concave. We find variations of the Ogee band, or moulding, properly speaking, in many of the period styles such as the Roman, Pompeian, Gothic, and in the several periods of the Renaissance. The "Astragal," a repeated bead form of Greek moulding decoration, Fig. 5, Plate 10, is another

motif used as a band or border, particularly popular in the so-called classistic style of the English Georgian period, and French Empire. "Interlaced bands" include all those which are formed of a number of lines interlaced or plaited together. The principle is that the interlacing broad lines shall pan under and over one another alternately, see Fig. 6, Plate 10. They are found principally in the styles of the middle ages, such as the Byzantine and Romanesque, and in all of the northern styles—Celtic, Scandinavian and Russian. The "Rosette band" is a name generally applied to bands having as the leading characteristic conventional roses seen in front view either in juxtaposition or divided by channels or by stalks or sprays, Fig. 7, Plate 10. Rosette bands are common in Assyrian. Gothic and Renaissance.

Link borders are formed of growing foliage connected by scrolls, such motifs as Palmette leaves, connected by circles or links, the lotus, papyrus, lily and pomegranate have been used. In the Greek, Roman, Egyptian, Gothic and Renaissance, the link band is generally composed of identical details or units, symmetrically repeated and was used in the earlier periods as a painted ornamentation, only later on receiving a plastic form.

Much more could be said on the subject of decorative bands if space permitted. It is an interesting study in itself and will well repay the art metal craftsman or designer to go into it more thoroughly than this paper allows. The next article will take up the use of animals, fish, etc., as decorative motifs.

(To be continued)

THE EXPANSION AND CONTRACTION OF BRASS CASTINGS

SOME FOUNDRY INFORMATION VALUABLE TO THE PATTERNMAKER AND FOUNDER.

WRITTEN FOR THE METAL INDUSTRY BY P. W. BLAIR, MECHANICAL EDITOR.

When brass and other non-ferrous metals are in their molten state they occupy more space than when cooled to the temperature of the atmosphere. In the natural process of cooling they contract and therefore it is necessary to make the mold in which such metals are to be poured of such proportions as to govern the contraction of the different metals. In order to enable the pattern maker to build up the patterns with the necessary allowance for this contraction of metal without wasting time making approximate allowances and calculations an instrument commonly known as a shrink rule is used. These shrink rules are made longer than the standard rules of measurement and are graduated proportionately. For instance the foot rule generally used for measuring a pattern from which a casting is required in cast brass would be longer than the standard rule.

For general work in casting metals the following contractions have been found to work out fairly well:

Brass (thick castings)	5/32	inch per foot
Brass (thin castings)	3/16	" " "
Copper	3/16	" " "
Aluminum	17/64	" " "
Zinc	5/16	" " "
Lead	¼ to 5/16	" " "
Tin	9/32	" " "
Silver	⅛	" " "

These rules will not hold good in every variety of casting and must not be taken too literally, as cases happen in the brass foundry which knock all one's pet theories on the head for it is only by practice and observation that just the exact allowance for contraction can be given for special classes of work.

A heavy casting will contract less than a light one as also will the various mixtures of brass contract differently. Cores will often prevent the free contraction of a casting and the rapid or steady lowering of the temperature of the metal in cooling and also has an influence on the ultimate size of a casting. There is always an element of uncertainty about the contraction of a badly proportioned casting and where heavy and light sections are combined there is danger of the casting cracking from the unequal contraction, making it necessary for the molder to expose the heavy parts to the air as soon as the solidity of the metal will admit.

A good example of uneven contraction is a large wheel with a heavy hub where the thin rib contracting faster than the hub often causes the arms to crack. The reason for this is that the metal in the thin rim has become solid and is already contracting faster and more than the hubs thus causing the arms to crack. When the hub solidifies it contracts and pulls the arms with it, causing a strain which will eventually make the arms crack and which is sometimes not noticeable when taking the casting out of the mold, unless a close examination is made of the casting.

The importance of proper proportions in laying out the design or making the patterns is a very necessary item and pattern makers in small shops where no draughtsmen are employed often have to design their own molds and it is absolutely necessary that they should be able to produce work in proper proportions and not put a big heavy hub on an otherwise light pulley. Or heavy ribs or flanges on a weak casting and think that by so doing the casting is strengthened. Some castings having heavy ribs crack much more readily than if the supposedly strengthening pieces were left off all together, owing to the strains caused by the cooling of the metal.

As an illustration of the unequal contraction of light and heavy castings we will assume that two bars are cast, each one foot long but one 4 inches in diameter and the other 2 inches in diameter. When measuring the cooled castings it will be found that the light one has contracted twice as much as the heavy one.

The most plausible theory that I can present for this unequal contraction is that some parts of castings must cool faster than others and it naturally follows that the outward portions—those nearer the sand of the mold—must be the first to solidify. In heavy castings the outside commences to cool and also endeavors to contract, but owing to the mass of metal inside of this crust being in a semi-molten condition and not yet in a state of contraction the outside is held in position or tension.

The effect of rapping and ramming of molds is another problem in the foundry where the castings are over-size or have shrunken way under-size. Castings about 6 inches or under in size will generally come out as large and some times larger than their patterns owing to the molds becoming enlarged by rapping the pattern.

The rule that appears to hold good is that a long light narrow casting will warp more than a broad heavy one and a slight excess of metal in a light casting will cause a curve in the direction of that excess.

THE MANUFACTURE OF TIN AND LEAD FOIL

A Brief Description of the Production of These Important Products.

Written for The Metal Industry by L. J. Krom.

In spite of the fact that the consumption of tin and lead foil is quite large, there are at the present time only a few producing mills in the United States. Four of the largest are Lehmeir, Schwartz and Company, of New York; Conley Foil Company, of New York; John J. Crooke Manufacturing Company, of Chicago, Ill., and the Johnson Tin Foil Company, of St. Louis, Mo.

Tin foil, as its name implies, is made of tin, being merely the pure metal rolled down to paper thinness. The extreme limit of guage used being in the neighborhood of .0003 of an inch and taking 20,000 square inches to make a pound, while lead foil with six per cent. of tin runs to .0004 of an inch and takes 7,000 square inches to make a pound.

The uses of tin and lead foil are many and varied. It is used to line boxes in which tea is packed, for all kinds of covering for food products, tobacco, chewing gum and candy. It is the basis in fairly thick guage of the collapsible tubes used for tooth paste, paints and in fact for any material put up in a semi-liquid form.

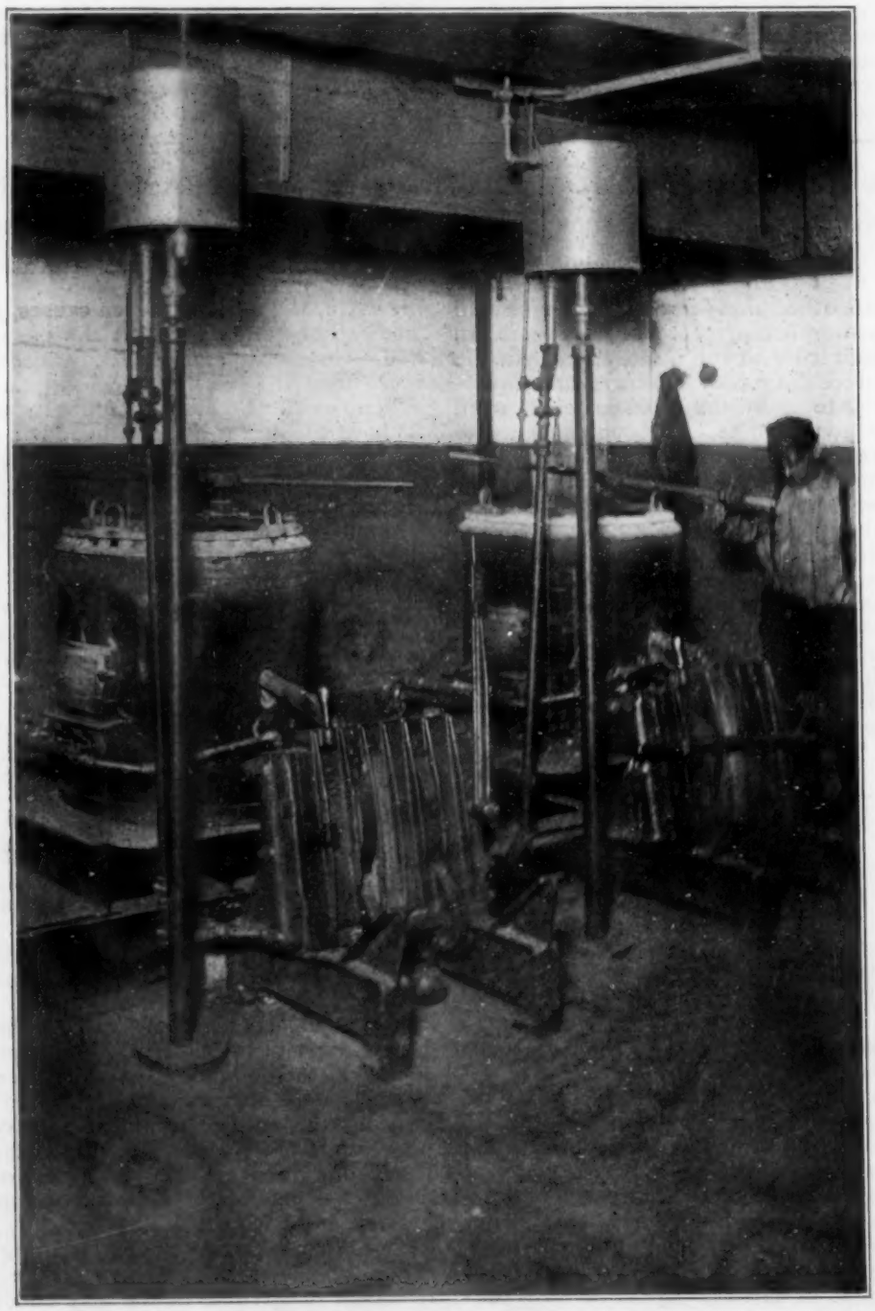

FIG. 1.—THE RAW MATERIAL IS MELTED, ALLOYED AND CAST INTO DESIRED WIDTHS OF SLABS READY TO BE ROLLED.

With the prevailing high prices for tin, the foil manufacturers have been forced to severe economies and the situation has been met by putting a sheet of lead between two sheets of tin and rolling down the three together, means of rolls similar to those employed for brass and copper and nearly as powerful. In contrast to the harder metals no annealing or pickling operations are necessary owing to the fact that the rolling is continuous, as

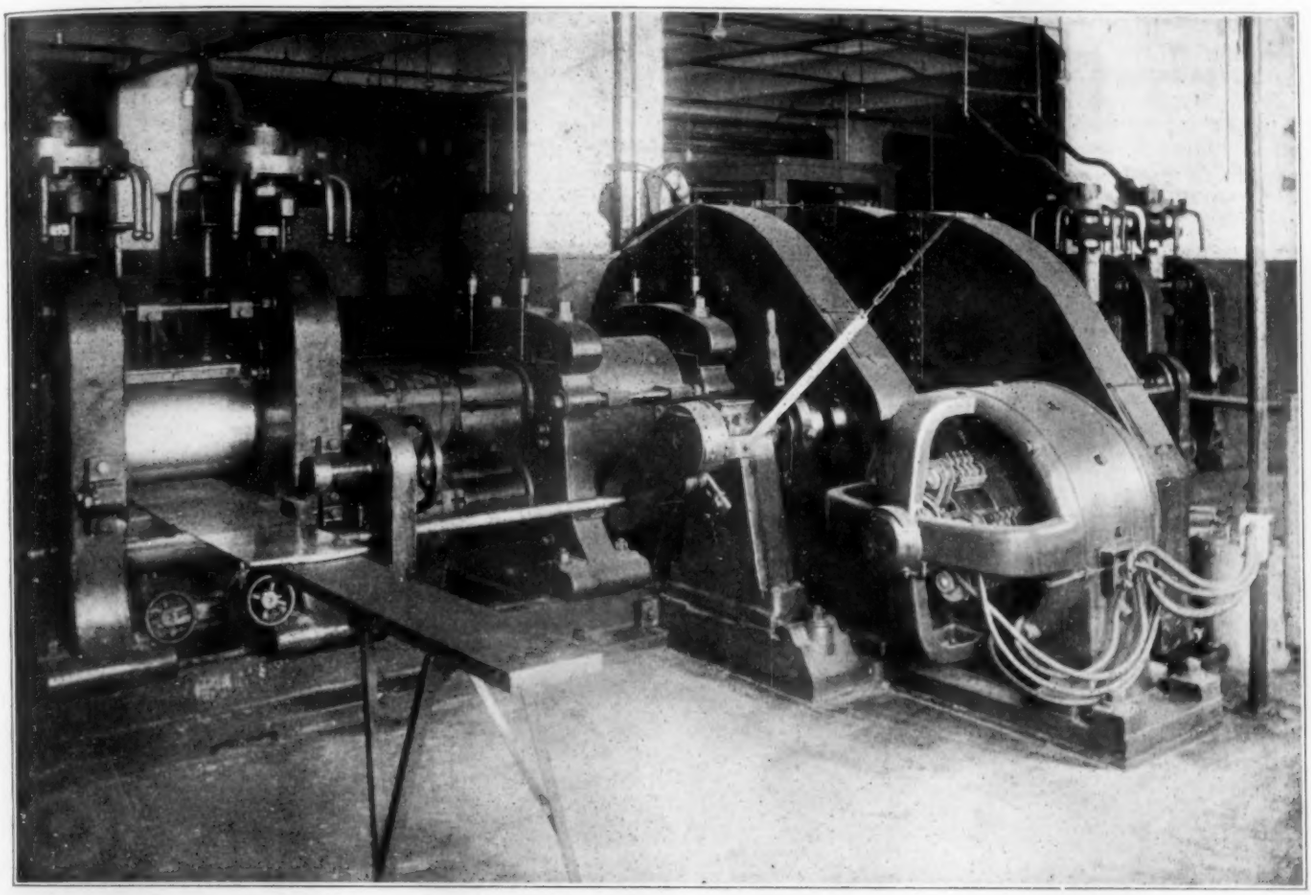

FIG. 2.—THE METAL SLABS FROM THE CASTING ROOM ARE BROUGHT TO THE MILL AND ROLLED IN SEVERAL PASSES TO A GIVEN THICKNESS.

this producing a foil having tin on both sides with a core or center of lead. On the other hand it has been found practicable to use lead foil with paraffin paper rolled on tin and lead do not harden appreciably by rolling.

The machinery required for the manufacture of this product, while not complicated, is quite expensive. A

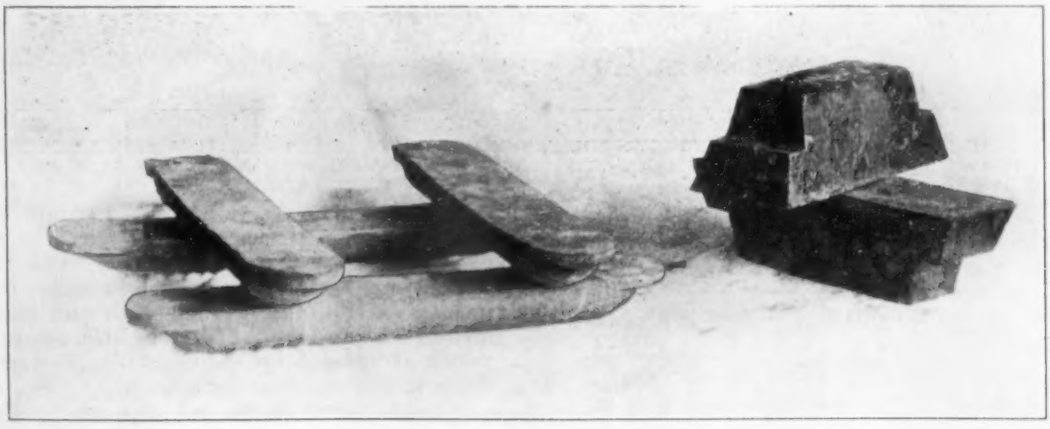

PHOTO OF INGOTS OF TIN AND LEAD USED FOR "TIN" FOIL.

the surface, thus eliminating the bad effects caused by the contact of lead with food products.

Tin and lead foil or the combination is made by simply rolling the metal to the required degree of fineness by plant of quite moderate output costing in the neighborhood of $50,000 with an equal amount of working capital.

The metal is first melted in oil or gas furnaces, as shown in Figure 1 and poured in the form of slabs in

the iron moulds shown in the fore-ground. From the casting room and without any annealing the slabs go to the rolling mill shown in Figure 2. Here they are passed through the breaking down rolls several times until the proper guage has been reached. From the "breaking down" rolls the metal goes to the "running down" or finishing rolls and after being given the required number of passes to bring it to the specified guage it is wound up on spools and then is handled in the same manner as paper. The finishing rolls are shown in Figure 4.

Figure 5 shows the machine in which the foil is slit and re-wound. The machine is fitted with a patented separator which prevents the slitted and re-wound metal from interlocking. The material spooled in this manner

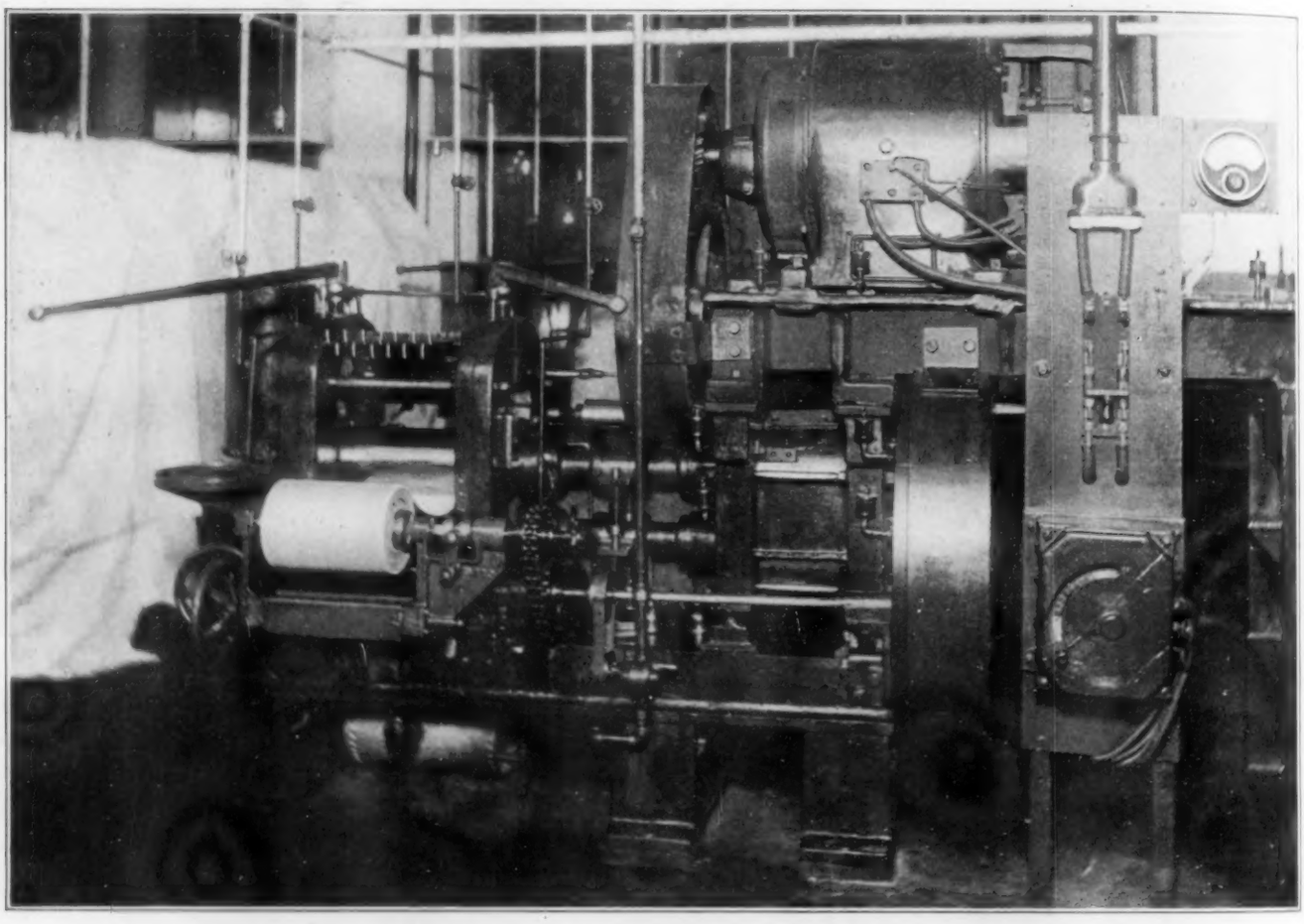

FIG. 4.—AFTER LEAVING THE BREAKING-DOWN MILLS, THE METAL IS RUN THROUGH THIS MILL TO THE REQUIRED THICKNESS AND WOUND UP ON SPOOLS OR REELS AND FROM THERE ON HANDLED THE SAME AS PAPER.

does not have to be wedged apart. Figure 6 shows a machine by means of which a design is embossed on the foil where it is desired to procure a fancy finish as is seen on foil used for confectionery, etc.

In order to roll the metal as thin as is necessary for the production of tin or lead foil, it is essential to grind a given shape to the rolls. This has been done in the past by hand, but there has lately been devised an automatic grinding and shaping machine, the invention of Svend Hansen, a rolling mill engineer and metal foil expert, and which is shown in Figure 7. The machinery shown in the photos accompanying this article is built by the Birmingham Iron Foundry, of Derby, Conn., who make a specialty of tin and lead foil installations.

METALS USED IN THE ORDNANCE DEPARTMENT

Very few citizens have any conception of the various ramifications of the work of the Ordnance Department, U. S. A., the idea generally prevalent being that it has something to do with guns and ammunition.

As a matter of fact, the Ordnance Department comes in contact and deals with practically every industry in the country and is daily placing orders with firms all over the United States for materials needed for the successful prosecution of the war. These orders cover a wide range and are placed in quantities that are frequently staggering to the average mind. Commodities formerly ordered in hundreds are now ordered in millions, those formerly placed in ounces, now ordered by the ton. A detailed list of the orders placed even for a short period would occupy too much space, but it may be of interest to those connected with the machines and metals trades to learn of some of the items, orders for which are placed by the Ordnance Department with those most important industries.

Pig tin, sheet brass and copper, manganese, soft aluminum wire for manufacturing purposes, copper tanks, needle and globe valves, wire cutter and stapling machines, aluminum sheets and rivets, copper clad wire rope, screw stock, brass discs, block tin, ingot and sheet aluminum, ingots of nickel silver and Lake Superior copper.

THE DEVELOPMENT OF ELECTRIC MELTING FURNACES

A Resume of Present Progress Contained in a Report to the United States Bureau of Mines.

By H. W. Gillett and A. E. Rhoads.

It seems inevitable that the next few years will see electric furnaces largely replacing crucible furnaces in the brass industry; a development comparable to that which the last few years have seen in the steel industry.

With Klingenberg clay not available, and Ceylon graphite requiring shipping needed for other purposes, crucibles, despite the good work done by crucible manufacturers, the Bureau of Standards, and others on the problem, are, speaking generally, still of much poorer quality, and as many times more costly, than they were under pre-war condtions. The time is ripe for practical elimination of the crucible from the brass industry.

With the huge tonnage of brass required for war purposes, the use of small units—averaging 200 pounds per charge—in which crucible melting is done by the brass rolling mills, seems, and is, an anachronism. Besides the avoidance of crucibles and the ability to melt larger charges, electric melting (in a suitable type of furnaces) decreases the loss of metal by oxidation and by volatilization, prevents the taking up of sulphur from the fuel, gives better and more healthful working condtions, and has many minor advantages such as freedom from handling and storing fuel and ash. Electric furnaces give crucible quality of metal without using crucibles.

However, not every type of electric furnace can be used for brass melting. If brass did not differ materially from steel in its behavior during melting, electric furnaces would long ago have superceded crucible furnaces. But brass is made up of copper and zinc, and zinc is volatile at brass melting temperatures. For this reason, fuel-fired furnaces of the reverberatory type can be applied to brass only at the expense of a zinc loss so high as to prohibit the procedure. Similarly, the direct arc type of electric furnace used for steel melting, such as the Heroult, can be used only on bronzes practically free from zinc, because of the high local temperature of the melt under the arc.

Indirect are furnaces, such as the Rennerfelt, can be used on brasses carrying up to about 20% zinc, but are not suitable for ordinary yellow brass, on

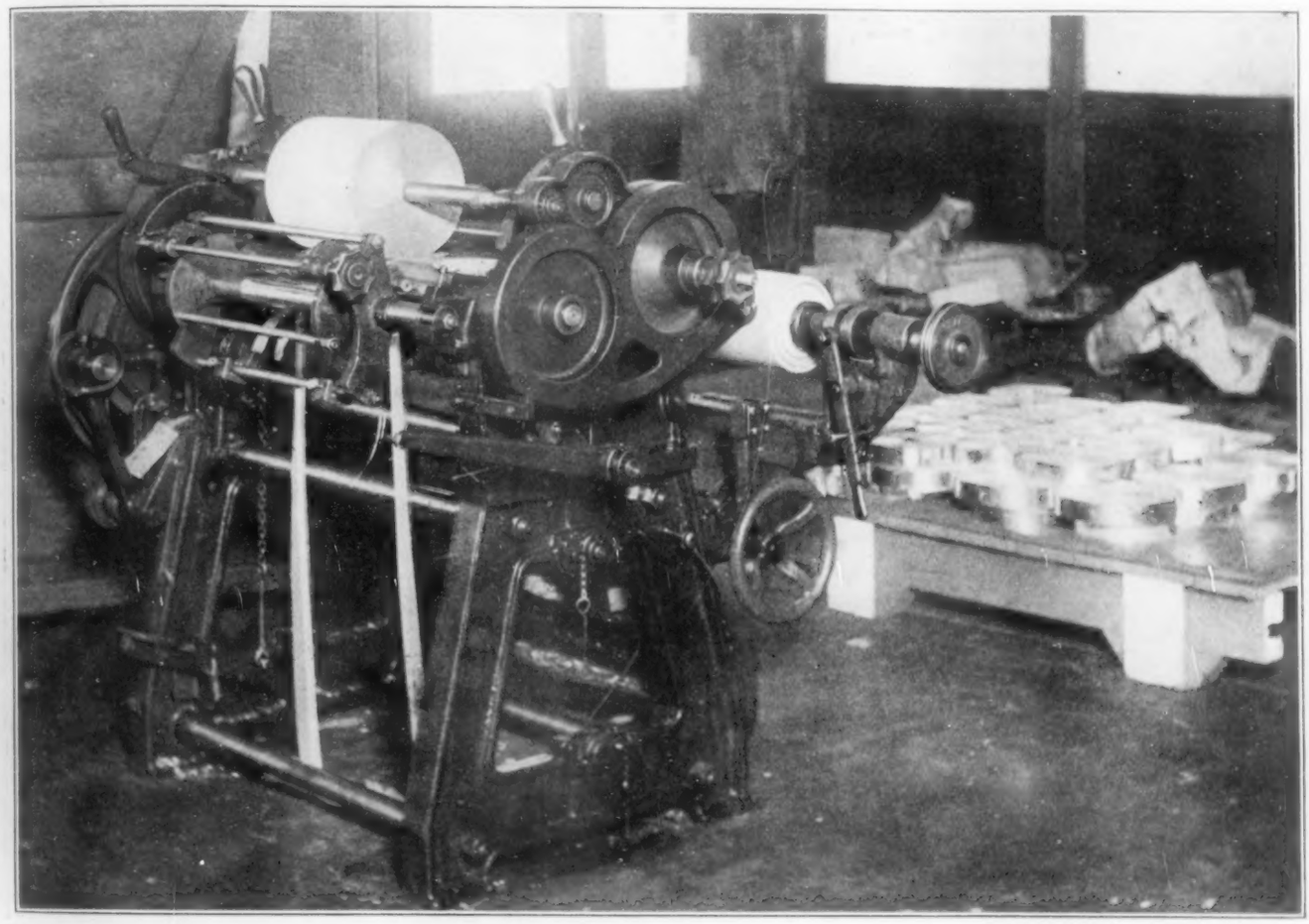

FIG. 5.—THE TIN FOIL IS NOW HANDLED THE SAME AS PAPER. WE SHOW PHOTOGRAPHS OF THE SLITTING AND REWINDING WITH PATENTED SEPARATOR, WHICH PREVENTS THE SLITTED AND REWOUND MATERIAL FROM INTERLOCKING. THE MATERIAL SPOOLED ON THIS MACHINE DOES NOT HAVE TO BE WEDGED APART.
Patented in the U. S. A., Canada, Great Britain, France, Belgium and Holland.

account of the formation of a superheated layer of the surface of the melt, directly under the arc, and the resulting volatilization of zinc.

Induction furnaces of the ordinary horizontal ring type, like the Rochling Rodenhauser, cannot be used on brass or bronze because high electrical conductivity of these alloys requires a secondary current so high that the "pinch effect" causes rupture of the secondary ring.

Hence it has been necessary to develop types of furnaces radically different from those in use for steel in order to meet the requirements of brass.

ELECTRIC BRASS FURNACES IN COMMERCIAL USE.

There are, however, two types of steel furnaces which have been applied to brass (using the term brass loosely to include bronze, red brass, etc.), the Snyder —a single phase direct arc furnace, and the Rennerfelt, a two-phase indirect arc furnace. At the Chicago Bearing Metal Company, Chicago, Ill., two one-ton Snyders and two one-ton Rennerfelts are melting bronze for railroad bearings, high in lead, but practically free from zinc. The metal losses are not much reduced from previous practice in crucibles and open flame oil furnaces, but the furnaces are making savings in melting cost as compared with either the crucible or the open flame furnaces under present conditions.

The Philadelphia Mint is melting nickel and coinage bronze in a 1,000 lb. Rennerfelt furnace. The Gerline Brass Foundry Company, Kalamazoo, Michigan, melts monel metal, red brass and brass containing up to about 20% zinc in an 800 lb. Rennerfelt. The furnace at the Gerline plant is run on a 9 hour basis, while the other furnaces mentioned operate 18 to 24 hours a day.

Two other types of furnace designed especially for brass melting, have also found commercial use, the Baily and the Ajax-Wyatt.

The Baily furnace uses a single-phase granular resister, the heat from which is reflected down onto the hearth from the roof. It takes charges of about 1,000 lbs. Baily furnaces are installed at the Lumen Bearing Company, Buffalo, N. Y., Hays Manufacturing Company, Erie, Pa., Bridgeport Brass Company, Bridgeport, Conn., and the Baltimore Copper Smelting and Rolling Company, Baltimore, Md. The Baily furnace is applicable to alloys of any zinc content, reduces metal losses, avoids crucibles, and gives good working conditions. The main drawback of this type of furnace is that the source of heat is not close to the melt and the heat must be reflected down from the roof. In order not to overheat the roof and cause its prompt failure, as well as to hold the resistor temperature within the limits that allow reasonable life of the resistor trough, the rate of power input is low compared to the size of the furnace and weight of charge. Hence the radiation losses from walls and

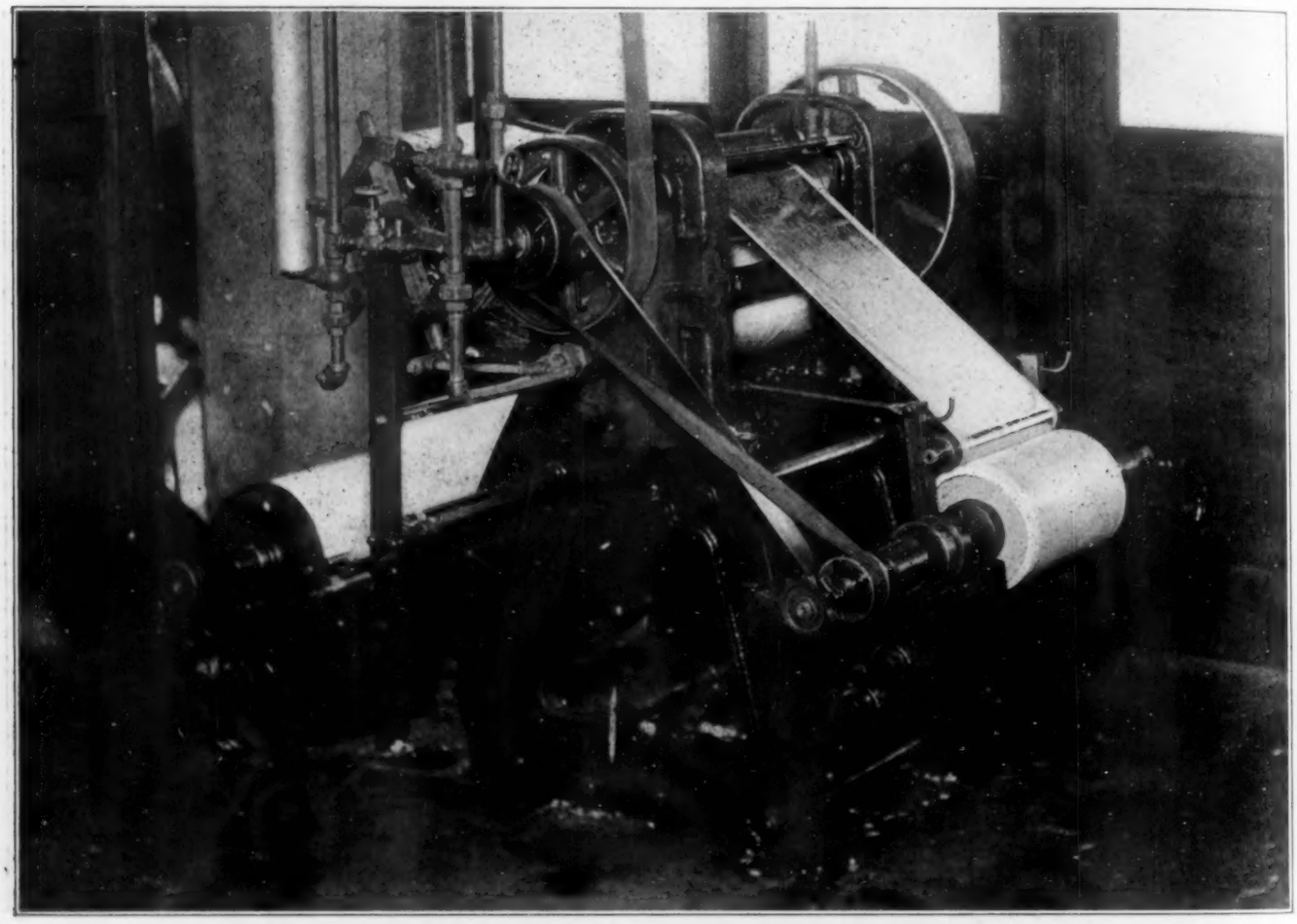

FIG. 6—THIS MACHINE IS USED FOR PUTTING DESIGNS ON FOIL OR PAPER. IT CONSISTS OF STEEL ENGRAVED ROLL AND PAPER ROLL.

roof form a large proportion of the total power. The furnace is at its best on 24 hour operation. When 10 hour operation is necessary, it is found that the furnace must be heated empty during all or part of the night in order to give satisfactory output in the daytime. Because of the high heat storage in the walls, a furnace of this type does not respond promptly to changes in power input, and accurate control of the temperature of the melt is difficult.

The Ajax-Wyatt furnace is a single-phase induction furnace in which the secondary ring is in the form of a loop below the level of the hearth proper, so that the hydraulic head of the metal in the hearth opposes the rupturing effect of the "pinch" force, thus avoiding the trouble that make horizontal-ring induction furnaces inapplicable to brass.

The metal heated on the secondary loop is constantly ejected at one part of each opening from loop to hearth, and colder molten metal drawn in at another part of the opening. These fountains of hot metal issuing from the resistor melt the charge in the hearth. The constant circulation of metal is a most desirable feature and gives a product of remarkably uniform chemical composition.

Because of the compactness of the furnace, the generation of heat within the metal itself, and the stirring action, vertical-ring-induction furnaces are extremely efficient as regard power consumption. The power factor, in the sizes so far built, is satisfactory.

The furnace must be started with a charge of previously melted metal, and sufficient metal to fill the loop must be retained when pouring. The metal in the loop must never be allowed to solidify, or the lining will be ruined. These facts make it difficult to change from one alloy to another, and require that the furnace be run 24 hours a day, or else receive enough power at night to keep the metal in the loop fluid. Ramming up and drying the refractory lining of the loop is a job requiring care and experience, as the lining must be perfect or its life will be short. No lining has yet been found that will withstand alloys containing over 3% lead, and the furnace has been developed mainly for yellow brass.

The furnace is fitted for rolling mill use, where 24 hour operation on yellow brass is the rule, but is distinctly less suitable for 10 hour runs or for foundries making a variety of alloys.

Several of these furnaces are in use at the Ajax Metal Company, Philadelphia, two at the American

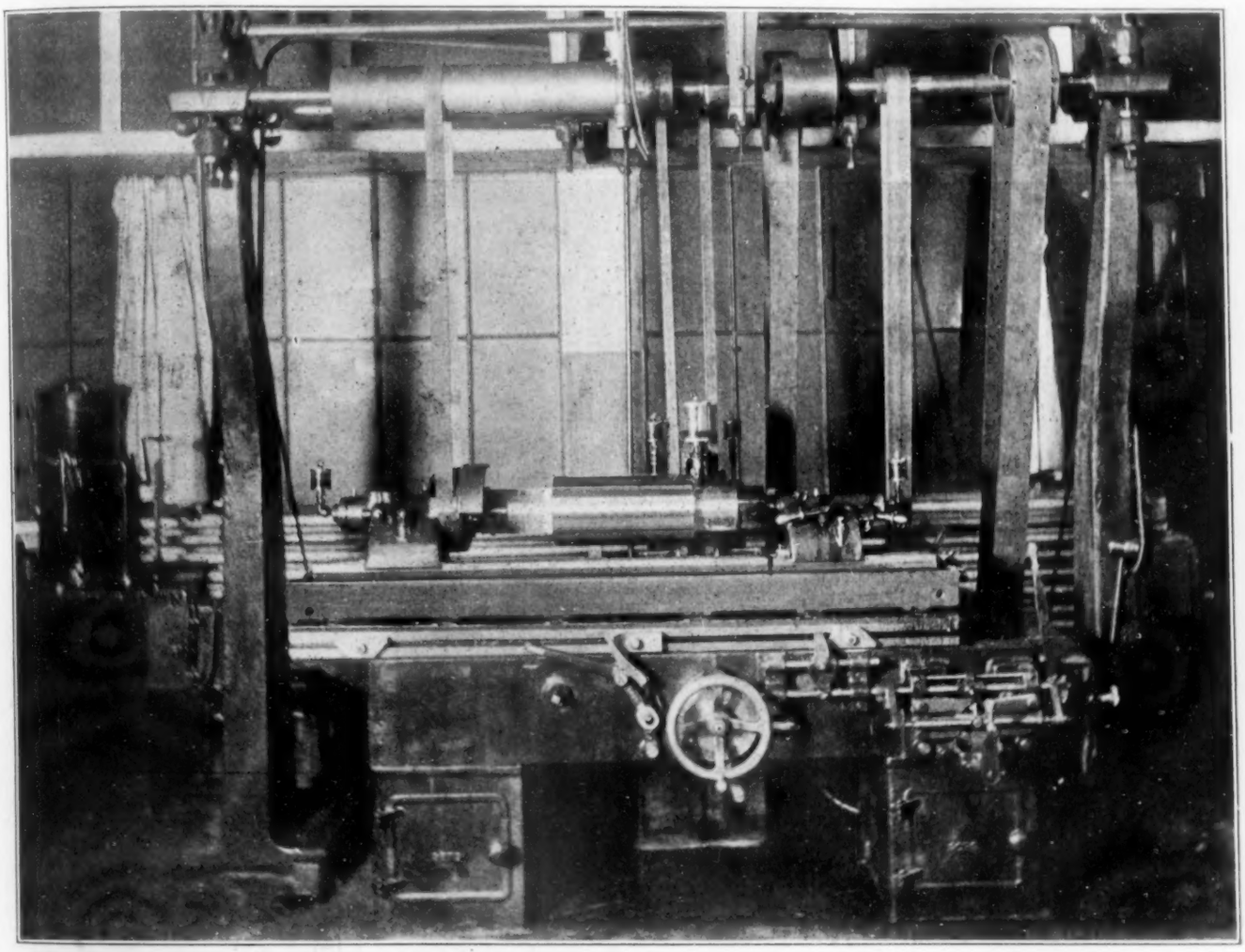

FIG. 7.—IN ORDER TO ROLL THIN METALS IT IS NECESSARY TO GRIND A GIVEN SHAPE TO THE ROLLS. THIS HAS FORMERLY BEEN DONE BY A HAND METHOD AND A VERY DIFFICULT OPERATION. THE ABOVE PHOTOGRAPH SHOWS AN AUTOMATIC ROLL GRINDER AND SHAPER. ANY UNSKILLED LABORER CAN LEARN TO RUN THIS MACHINE IN ONE DAY AND IS ABLE TO RUN SEVERAL MACHINES AT THE SAME TIME.

Brass Company, Waterbury, Conn., and twenty-eight at the Bridgeport Brass Company, Bridgeport, Conn. The furnace saves zinc, avoids crucibles, and shows so low a power consumption on 24 hour operation that it can doubtless be used to advantage in rolling mill practice even under normal prices of fuel and crucibles.

FURNACES UNDER EXPERIMENTAL TESTS.

Besides the four types mentioned above, each of which has found commercial use where conditions were suitable there are four other furnaces that have reached a semi-commercial stage, but are still under experimental development.

The Bennett furnace at the Scoville Manufacturing Company, Waterbury, Conn., is a three-phase furnace, probably of about 750 lbs. capacity, and resembles a direct arc furnace. However, the voltage between electrodes (which are automatically regulated) and bath is kept so low that there is no true arc and the heat is generated by a sort of contact resistance. This is said to give low metal losses and to show a reasonably low consumption of power.

The furnace has run mainly on yellow brass and is therefore probably applicable to all brasses and bronzes. The results of the work have so far been kept secret and no detailed data is available.

The Foley furnace is a single-phase, vertical ring induction furnace, similar in general design to the Ajax-Wyatt (although differing from it in many points). One such furnace of about 1,000 pounds capacity has been in experimental operation at the Bristol Brass Company, Bristol, Conn., and three 3,000 pound furnaces are under construction. From the small amount of data so far available on this furnace, its metal losses and power consumption will be about the same as in the Ajax-Wyatt, because of its larger size, its power factor is somewhat lower. It has the same disadvantages as regards starting the furnace, changing from one alloy to another, and the necessity for 24 hour operation, as that furnace.

The General Electric furnace is a smothered arc, one or two (normally two) phase furnace, of about 1,500 lbs. capacity, having four depending electrodes, two on each side of hearth. Between the tips of each pair of electrodes is a carbon block to which arcs are drawn, the arcs being smothered by granular coke. The heat thus generated is reflected down onto the hearth by the roof. The electrodes are automatically regulated.

After being tested at the General Electric Company, Schenectady, N. Y., this furnace has been installed for further test at the Chicago plant of the Crane Company, but is not yet considered ready for general commercial use.

The heat transfer in this type is similar to that in the Baily, and the furnace seems theoretically capable of a performance of about the same order as the Baily with similar advantages and similar drawbacks. As the General Electric furnace takes a higher power input than the Baily, it may be slightly more efficient in power consumption, but the roof is subject to even more severe conditions and will require the use of high grade refractories to give good life.

The Northrup furnace, being developed by Prof. E. F. Northrup and the Ajax Metal Company, is an induction furnace, heating the charge by means of eddy currents instead of making the charge or part of it, the secondary of a transformer. Oscillating current of very high frequency is used instead of alternating current, and is obtained by the use of condensers or of a special generator. A 60 K.W. tapping type furnace is being tried out. The Northrup furnace has a high power factor, and can take multi-phase current. It is being developed in order to produce a furnace suitable for 10 hour operation and for facility in changing from one alloy to another.

Since the heat is generated within the charge itself, the eddy current should be efficient in power consumption. This type is theoretically very promising, but its development has not yet gone far enough to show what, if any, mechanical limitations the type has.

WOMEN IN THE WAR. WORKERS AT THE PLANT OF THE CHASE METAL WORKS, WATERVILLE, CONN., DOING THEIR PART IN RELIEVING MEN FOR THE FRONT. THESE GIRLS ARE OPERATING A NINE ROLL ROD STRAIGHTENER.

EXPERIMENTS WITH THE COPPER CYANIDE PLATING BATHS

A Paper Presented at the Thirty-third General Meeting of the American Electro-chemical Society, held in the Appalachian South, April 28-May 5, 1918.

By Frank C. Mathers*

ABSTRACT.

It was found that the current-yields (ampere efficiencies) at the cathodes were generally lower than those at the anodes, hence the necessity of making the regular additions of sodium cyanide to the baths. Sodium carbonate and perhaps sodium sulphate are valuable additions to the bath. In baths containing near to the minimum of sodium cyanide, sodium hydroxide lowered both the anode and the cathode yields. The anode yields are high in both hot and cold solutions if a proper quantity of sodium cyanide is present, but the cathode yields are much lower in the cold solution than in the hot. A bath containing 6 oz. (4.5 per cent) copper cyanide, 5.7 to 6.3 oz. (4.3 to 4.7 per cent) sodium cyanide and 5.8 oz. (4 per cent) sodium carbonate per gallon operated at 160° to 175° F. (60° to 80° C.) is recommended. This is more concentrated than the baths generally used, but it can be operated at a higher current and the deposits are much better.

INTRODUCTION.

These experiments were undertaken to study the building up or the increase in copper concentration of the bath. Sodium cyanide must be added regularly to copper baths, otherwise the anodes become covered with slime and do not dissolve. Several things may contribute to the necessity for the addition of the cyanide. It is likely that the sodium cyanide is slowly decomposed in the hot solution into ammonia and sodium carbonate. If the solution builds up or increases in concentration of copper, the addition of cyanide would be necessary to care for this increase. The method of studying the building up was to determine the current yields by comparison with a copper coulometer.

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METHOD OF THE EXPERIMENTS.

A study was made of the effects upon the current yields by the substances which are ordinarily used in the copper baths. The baths had a volume of 200 c.c. (about 0.5 pint). The cathodes and anodes were each 1.5 in (3.8 cm.) squares of copper.

COMPOSITION OF THE BATH USED COMMERCIALLY AND SOME RESULTS WITH COLD SOLUTIONS.

A bath that is widely employed contains 3.12 oz. (2.34 per cent) sodium cyanide, 3 oz. (2.25 per cent) copper cyanide, 1 oz. (0.75 per cent) sodium carbonate and 0.25 oz. (0.17 per cent) sodium hyposulphite. Other formulas give less concentrated baths, but preliminary experiments showed that much better current yields, better deposits and higher current strengths could be obtained with the more concentrated solution, hence all of the following experiments were with baths, containing 6 oz. (4.5 per cent) of copper cyanide. The hyposulphite is used only as a brightener, hence it was not tried in these experimental baths. At room temperature and 6 amp. per sq. ft. (0.65 amp. per sq. dec.), solutions containing 7.6 oz. (5 per cent) or more of sodium cyanide and 6 oz. (4.5 per cent) copper cyanide gave anode yields of approximately 100 per cent but the cathode yields were from 84 to 89. With smaller amounts of sodium cyanide the anode yields were reduced, but the cathode yields never reached 100 per cent. Sodium carbonate did not show much effect, but sodium hydroxide (3.2 oz. or 2.4 per cent) distinctly lowered the anode yield. With larger quantities of sodium cyanide, the sodium hydroxide did not show this effect. In several cases, small amounts of Rochelle salt (0.7 oz. or 0.5 per cent) increased the cathode yields and kept the anodes bright and

COPPER CYANIDE PLATING BATHS, WITH HOT SOLUTIONS.

	Composition in Per Cent.					Current Yields in Per Cent.					
						6 Amp. per Sq. Ft.		10.8 Amp. per Sq. Ft.		6 Amp. per Sq. Ft.	
No.	NaCn	Na_2CO_3	NaOH	Rochelle Salt	Na_2SO_4	Anode	Cathode	Anode	Cathode	Anode	Cathode
26	5.4	...	...	...	...	100	97	...	...	...	...
27	5.4	...	0.5	...	...	...	94	...	...	...	...
28	5.4	...	1.0	...	...	100	92	...	...	...	...
29	5.4	...	2.0	...	...	100	90	...	...	...	...
30	5.4	0.5	...	...	...	96	97	...	...	...	...
31	5.4	1.0	...	...	...	100	97	...	...	...	...
32	5.2	...	0.5	...	0.5	100	97	...	...	...	...
33	5.2	...	0.5	...	1.0	101	97	...	...	...	...
36	5.2	...	...	0.5	...	101	94	...	...	...	...
37	5.2	...	...	1.0	...	101	96	...	...	...	...
38	4.7	0.7	...	...	...	...	...	100	*	...	...
39	4.5	...	...	...	...	...	...	100	*	...	...
40	4.7	...	...	...	...	...	...	100	96*	...	...
41	4.9	...	...	...	...	...	...	...	95	...	...
42	4.7	...	1.0	...	...	...	...	78	91	...	...
43	4.7	...	4.0	...	...	...	...	0	72	...	...
44	4.7	4.0	...	...	...	...	...	100	97†	...	...
45	4.7	...	...	...	1.0	...	...	100	98	...	...
46	4.7	...	...	...	4.0	...	...	97	95	...	...
47	4.7	...	...	4.0	...	...	...	98	95	...	...
56	4.1	1.0	...	...	...	...	...	...	...	101	101
57	4.1	1.0	...	...	4.0	...	...	...	...	96	101
58	4.3	1.0	...	...	4.0	...	...	...	...	101	...
59	4.5	1.0	...	...	4.0	...	...	...	...	98	...
60	4.1	4.0	...	...	...	...	...	...	...	100	100
61	4.3	4.0	...	...	...	...	...	...	...	100	100
62	4.5	4.0	...	...	...	...	...	...	...	103	97

*Poor deposits. Loose material on edges. †Excellent deposit.

more free from a dark color. The results with these cold solutions show that the baths would build up very rapidly due to the quantity of copper dissolved from the anodes being greater than that deposited upon the cathodes.

HOT SOLUTIONS.

Baths heated to 175° F. (80° C.) gave high cathode yields and excellent cathode deposits. For these reasons it is inadvisable to work a cold solution. The table shows the results of the experiments with the hot solutions. Each bath contained 6 oz. (4.5 per cent) copper cyanide. The compositions are given in percentages (grams for 100 c.c.) and may be changed to oz. per gal, by multiplying by 1.33.

EFFECT ON HEAT

Baths 26 to 31 averaged 94 per cent cathode yields, while they only gave 85 per cent in cold solutions. It must be remembered also that these baths contained more sodium cyanide than is required for a hot solution. The most important effect of the heating is to increase the current yield at the cathode.

EFFECT OF SODIUM CYANIDE.

Baths 38 to 41 show that a variation of free cyanide from 4.5 per cent to 4.9 per cent makes no difference in the results. With too low a quantity of cyanide the cathode tends to be less smooth and firm.

EFFECT OF SODIUM HYDROXIDE

Baths 42 and 43 show the injurious effect of free sodium hydroxide. With 4.7 per cent sodium cyanide, 1 per cent hydroxide reduced the anode yield to 78 per cent and 4 per cent of sodium hydroxide brought it to 0. By increasing the cyanide to 5.2 per cent in each of these baths, the yields became 96 and 80 for the anodes and 83 and 53 for the cathodes respectively. The injurious action was most noticeable when the bath was operated under severe conditions as regards high current and low cyandie content. These results show that sodium hydroxide should not be added to the baths unless it has some other action than those studied in these experiments.

EFFECT OF SODIUM CARBONATE.

Baths 44 and 60 to 62, show that sodium carbonate is a valuable addition. With low cyanide (4.1 per cent) the anode yield was perhaps no lower than without the sodium carbonate even at very high currents. With more cyanide (4.7 per cent), the anode yield was 100 per cent and the cathode yield was 97 per cent. Moreover the deposits had a better color and were smoother on the edges than without the sodium carbonate. At lower currents, the yields were approximately 100 per cent at both electrodes.

EFFECT OF SODIUM SULPHITE.

Baths 32, 33, 57, 58 and 59 show that sodium sulphate does not lower either the anode or the cathode yield. The color of these deposits was excellent. The use of sodium sulphate seems to advantage, but enough experiments were not tried to prove it.

EFFECT OF ROCHELLE SALT.

Rochelle salt gave the baths a blue color. It had a tendency to cause loosely attached particles to form upon the edges of the cathodes. In view of the better anode corrosion which it produced when only small quantities of cyanide were present, a further study of its use should be made.

CONCLUSIONS AND RECOMMENDATIONS.

1. A more concentrated solution than the one usually employed is recommended. With the more concentrated solution, a higher current can be employed, a thicker deposit can be obtained without bad edges or corners and the cathode yields are higher.

2. The bath should be worked hot on account of the better cathode yields.

3. Very little free cyanide is required to keep the anode corrosions almost to 100 per cent in either hot or cold solution.

4. Sodium carbonate is of advantage and it seems that sodium sulphate is likewise a help. The effects of these substances should be studied under conditions of commercial operation for a long period of time before definite conclusions should be drawn concerning them.

5. Under all conditions of operation that give a satisfactory deposit, the anode current yields are likely to be higher than those of the cathode, hence there is a building up or an increase in copper concentration.

6. Sodium cyanide in sufficient quantity to replace that which is lost by decomposition and that neutralized by the extra copper which gradually accumulates, is all that is required to maintain the bath.

7. The following composition is recommended:

	Per cent	Oz. per Gal.
Copper Cyanide, CuCn.....	4.5	6
Sodium Cyanide, NaCn.....	4.3 to 4.7	5.7 to 6.3
Sodium Carbonate, Na_2CO_3.....	4.0	5.3

This bath gave approximately 100 per cent current yields at both electrodes, hence there would be little increase in metal content. However, there is a tendency for the cathode yields to be lower than those of the anode whenever the operating conditions become severe or when too much cyanide is present.

8. This bath can be operated at 6 to 9 amp. per sq. ft. (0.65 to 1 amp. per sq. dec.) which is double that which can be used on the dilute baths ordinarily recommended. A still higher current can be used, but the current yields are lower and the deposits are less smooth.

PLATING STEEL KNIVES.

The following methods have proved satisfactory in filling the pin holes in steel knives and forks before plating:

First—Remove the old silver from the knives or forks by making them the anodes in the silver solution and the silver going into solution may be re-deposited as usual.

Second—Clean and dry the knives and forks following the stripping operation.

Third—Procure a small iron pot about four or six inches in diameter and of sufficient depth so that the knives or forks can be completely covered when immersed and still allow two or three inches besides.

Fourth—Arrange to heat the pot to the melting point of solder. The molten metal mixture should consist of equal parts of tin and lead or two parts of tin and one part of lead.

Fifth—The knives and forks should be strung on wires and immersed in a chloride of zinc and sal ammoniac flux following the cleaning and drying. The flux consists of a saturated solution of zinc dissolved in muriatic acid or the regular chloride of zinc soldering fluid. To every gallon of flux add one pound or more of sal ammoniac. Immerse the articles for a few seconds, then shake well and immerse in the molten tin mixture. When the articles are completely tinned, cool in paraffin oil as water cooling makes the tin lumpy.

After tinning polish the knives and forks down to a surface being careful not to overheat in polishing. The pin holes will be found to have been filled completely if the methods mentioned are followed closely. —C. H. P.

ALUMINIUM-BRONZE DIE-CASTING*

AN ARTICLE DEALING WITH THE EFFECTS OF IRON AND MANGANESE ON COPPER ALUMINUM ALLOYS.

BY H. RIX AND H. WHITAKER, M.Sc.

Die-castings may be defined as "finished castings made by pouring molten metal, flowing by gravity or under other external pressure, into a metallic mold."

ADVANTAGES OF DIE-CASTING

Some of the advantages of die-casting are:

1. The accuracy and uniformity of the castings. They can be made to specification 0.005 per inch, or even less for small parts.
2. Machining costs are either eliminated altogether or are greatly reduced.
3. The process is continuous, and the output is generally much greater than is the case with sand-casting.
4. Articles which it would be impossible to sand-cast may be successfully die-cast.

Although the process has been in operation for over twenty years, it is only during the last ten years that it has assumed importance as a separate industry, and this is largely due to the development of the automobile and aeroplane.

The alloys employed may be divided into five classes according to whether the principal constituent is (1) zinc, (2) tin, (3) lead, (4) aluminum, (5) copper.

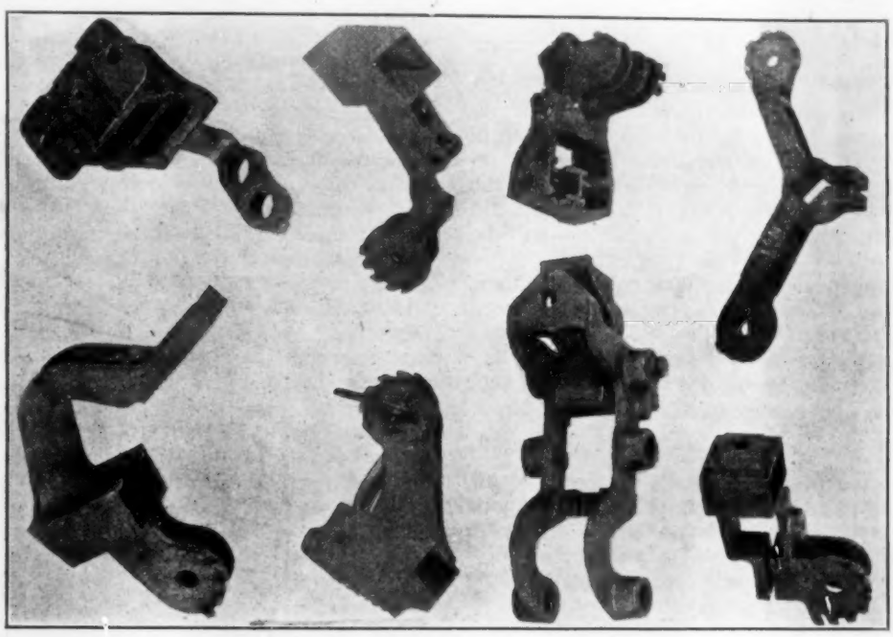
Owing to their low melting points, alloys of the first three classes were initially employed, but the castings lacked strength and rigidity. An average zinc base alloy has a tensile strength of about 8 tons per square inch, with practically no ductility, but these alloys are very liable to corrosion and distortion.

The tin- and lead-base alloys include a large number of the "Babbitt" or bearing-metal type, and many bearings are now being die-cast.

The low specific gravity, cheapness, and strength (when alloyed) of aluminum have been the principal factors in its development as a die-casting metal. The chief drawbacks are:

1. Its high melting point (compared with lead, tin, and zinc).
2. Its tendency to attack iron when molten.
3. Its high shrinkage.
4. Its weakness at high temperatures.

On account of (2) the "plunger" type of machine has been largely superseded by one employing air-pressure, or by utilizing the pressure of the riser or gate. A die using zinc-base alloys lasts almost indefinitely, but, when using aluminum alloys, cracks begin to show after two or three thousand castings have been made. The high shrinkage of aluminum has been reduced by alloying, and need not exceed about 1.4 per cent.



EXAMPLES OF ALUMINUM BRONZE DIE-CASTINGS.

The weakness of the alloys at high temperatures is responsible for the formation of cracks which develop while the metal is solidifying in the mold. Thus the strength of the copper-aluminum alloy containing, say, 12 per cent copper drops from 8 to 10 tons per square inch at 0 degrees C. to 3 to 5 tons at 350 degrees C.

Notwithstanding these drawbacks, aluminum alloys of very variable composition are being successfully die-cast on a large scale.

BRASS AND BRONZE DIE-CASTING

The next step in the process was to surmount the difficulties connected with copper-base alloys, which have a much higher melting point. The literature on the subject is as yet very scanty, but most of the workers in the field express the opinion that brass or bronze die-casting is almost a commercial impossibility. On reading the accounts of the work done by the Doehler Die-Casting Company,[1] Work,[2] Webber,[3] Schulz,[4] Pack,[5] and Norton[6] one arrives at the following conclusions:

*Paper presented at a recent meeting of British Institute of Metals.

[1]Doehler Die-Casting Co., Brooklyn, N. Y.
[2]"Mechanical World," October 8, 1916.
[3]"Machinery," January, 1916.
[4]"Mechanical World," July 21, 1916.
[5]"Transactions of the American Institute of Metals," 1914 and 1915.
[6]Ibid., September, 1914.

1. The chief difficulty in the process is the high temperature (900 to 1,000 degrees C.) for casting "yellow metal." This has several effects. The zinc in the brass attacks the steel die, which rapidly deteriorates, so that no more than 1,000 castings can be obtained. The high shrinkage of brass sets up strains within the die which further impair its accuracy. Since the die cost (anything from £5 to £200) is the prime factor in die-casting, this is a serious matter. For the same reason it is impracticable to use an iron container for the molten metal, as the alloy would rapidly become contaminated thereby; hence air pressure cannot be employed to force the metal into the die. This means pouring from the crucibles, with consequent slowing down by production, if (as is often necessary on account of expenses) only one die can be used. Another consequence of the high temperature and slow pouring is the large amount of dross which is formed. Also ordinary brasses are not sufficiently strong at high temperatures to withstand the shrinkage strains which are set up.

2. It is very difficult to produce brass die-castings which are consistently free from blow-holes or shrink-holes. The former are caused by air being entrapped in the mold, and they cannot be overcome by simply increasing the pressure in the mold or by carrying out the process in vacuo. By a careful study of the venting and gating of each part, however, this unsoundness may be practically eliminated.

3. Brass and bronze die-castings are only a commercial success if the parts cannot be completely produced by automatic machinery, or when they obviate numerous difficult machining operations, involving different settings of tools. To compete with the machined products the die-castings must be rapidly made, must be accurate to within $\pm$ 0.002 per inch, and must have a smooth polished surface. Recent developments in foundry and machine shop practice have made it possible for many parts to be now more cheaply sand-cast, and "yellow" metal die-casting is "practically restricted to pieces of fairly simple shape, weighing between ½ ounce and 3 pounds."

The experiences of the authors in this connection have been chiefly in the use of brass (60:40) containing about 2 per cent aluminum; manganese brass, and "aluminum-bronze" containing iron. In the first case, the aluminum is added to give fluidity to the metal and better definition to the castings. In the second case manganese brass of usual composition is used, containing less than 1 per cent manganese, with a little iron and aluminum. The chief objection to these metals is that the surface of the die becomes rapidly covered with a coasting of zinc oxide, which must be brushed off after every cast of the definition is spoiled. Various methods have been tried to overcome this difficulty, but so far without complete success.

Our best results, however, have been obtained with "aluminum-bronze" containing iron. The first alloys experimented with were of copper-aluminum containing about 10 per cent aluminum, the balance being copper. The results were disappointing, for the metal did not lie so "kindly" to the surface of the die as it might have done, and the definition of the edges was poor. After repeated trials it was decided to add a little iron, when much better results were obtained.

In their masterly research on the copper-aluminium alloys Carpenter and Edwards[7] brought the investigation to a point "where the way is clear for investigating the influence of a third metal." Rosenhain and Lantsberry[8] in their introduction to the Ninth Report, discuss the reasons which led to the selection of manganese as the third metal, and it is rather singular that iron does not seem to have been considered as even a possibility. Vickers[9] alludes to the prejudice which appears to exist in the minds of most foundrymen against iron in copper alloys, probably due to its harmful effect when present in brass in any quantity. He also states that the use of iron in "aluminum-bronze" is no new thing, but has been common in Germany and the United States for some years. While claiming that it improves the metal for sand-casting, he questions its use in die-casting, for the following reasons:

1.—In sand-castings it is necessary to add iron in order to prevent the "excessive crystal growth" which is "such a drawback to the 10 per cent aluminum bronze."

In die-castings this is not necessary, as the chilling effect of the die is sufficient to keep down this growth.

(That the iron has this effect is shown by Corse and Comstock.[10] Combined probably with aluminum and copper the iron is the first constituent to separate out, in the form of small black crystallites which form nucluei round which the *a* solution crystallises, thus reducing the grain size.)

2.—Iron accentuates the shrinkage of the bronze, consequently increasing the tendency to form the pear-shaped cavities commonly found in aluminum-bronze die-casting.

The authors do not agree with the above conclusion limiting the usefulness of copper-aluminum-iron alloys to sand-castings, having produced many thousand die-castings in these alloys.

The cavities referred to are certainly a difficulty to be overcome. They are either shrink-holes, caused by the large contraction of the metal, or blowholes caused by air being entrapped in the die by the molten metal, and they may be detected in a casting by finding its specific gravity. Their direction is often radial, and they may be colored black inside. In either case they may be practically eliminated by a careful study of gating, venting, etc.

Tetmajer[11] has worked with "aluminum-bronze" containing iron and silicon, but what appears to be the most complete account of the copper-aluminum-iron alloys is by Corse and Comstock.[12]

They have studied the properties of the possible combinations containing 1 to 4 per cent iron and 7 to 10 per cent aluminum inclusive. Their conclusions are that "for the same aluminum content there is always an increase of proportional limit, yield point, and ultimate tensile strength with increasing iron content, and in general a rather less substantial decrease in elongation and reduction of area. In the same way, with constant iron content, the proportional limit, yield point and ultimate tensile strength increase with increasing aluminum, while the elongation and reduction of area decrease. Also, that for a given strength, better ductility can be obtained with a lower aluminum and high iron alloy, than with higher aluminum and low iron."

It is, of course, difficult to compare the results of different workers on similar alloys, owing to lack of uniformity in methods of preparation and testing, but a comparison of the results contained in the Eighth and Ninth Reports to the Alloys Research Committee, and those obtained by Corse and Comstock, leads to the following conclusions:

1. Iron and manganese, when added respectively to copper-aluminum alloys (containing 7 to 10 per cent

[7]Carpenter and Edwards: "Eighth Report to the Alloys Research Committee," 1907.
[8]Rosenhain and Lantsberry: "Ninth Report to the Alloys Research Committee," 1910.
[9]"Mechanical World," August 17, 1917.
[10]"Transportation of the American Institute of Metals," September, 1916.
[11]Mitteilungen der Material-prufungsanstalt," IX. Heft.
[12]"Transactions of the American Institute of Metals," September, 1916.

aluminum), have a similar effect—i. e., the yield point and ultimate tensile strength are raised at the expense of the ductility.

2. In the case of sand-cast bars, the addition of iron appears to give better all-around mechanical properties than the addition of an equal amount of manganese. The data are not available for a complete comparison of the chill cast bars, but some promising results have been obtained by the authors with alloys containing 7 to 10 per cent aluminum and 1 to 4 per cent iron. The authors are producing die-castings commercially in one of these alloys, and the following are the average results recently obtained from twenty-four test bars, cast in 1 in. chill and cooled in air.

It should be pointed out that each bar represents a batch of castings, produced consecutively during a period of several months, under ordinary foundry conditions.

Diameter of Test-section.	Point. Yield	Ultimate Strength. Tensile	Elongation Per Cent. on 2 In.	Reduction Area Per Cent. of
= 0.564 in.	14.7 tons per sq. in.	35.5 tons per sq. in.	24	21.8

These results compare favorably with those for the chill cast bars containing 7 to 10 per cent aluminum given in the Eighth Report, and for those containing 8 to 10 per cent aluminum and 1 to 5 per cent manganese given in the Ninth Report. In several cases the latter alloys give better results, but whether they may be die-cast or not is open to question.

HEAT TREATMENT

The mechanical properties of the copper-aluminum-iron alloys may be profoundly modified by heat treatment, and this probably accounts for the variable results obtained with the same metal under ordinary casting conditions. Conseqnently, accurate pyrometric control of the die-casting process is advisable, if consistent results are required. The temperature of the molten metal should be known, and that of the die itself, also the rate of cooling of the hot casting shou.d be standardized. Much different mechanical properties would result if instead of quenching the casting red hot from the chill, in cold water, it were allowed to cool slowly in air.

An advantage of the alloy used by the authors is that it is sufficiently fluid to fill the die and give satisfactory castings through a wide range of temperature.

MATERIAL FOR DIES

The authors have experimented with several materials, ferrous and non-ferrous, for die-making, but have had the best results with a close-grained cast iron, as hard as is consistent with good machining properties. The block of iron from which the die is made is itself chill cast, to give these qualities. Sometimes the dies have been cast almost to shape before machining, but the results have not been very satisfactory.

It need not be pointed out that a die when once made is only suitable for one particular alloy. Each alloy has its own requirements regarding gating, venting and shrinkage, and the particular problems of each new part render it very difficult to make a correctly designed die at the first attempt. In an iron die as described above, there can be made from 5,000 to 7,000 castings similar to the "Butterfly" type of carbon brush-holder (marked No. 1) that is shown, along with other examples of die-casting, in Plate I, before it shows signs of deterioration. No facing or special treatment of the die surface is necessary, nor is the die cooled down every few minutes; but the plugs, which are of steel, are dipped in a graphite wash between each cast to preserve their shape; even then they do not last so long as the die. The other photographs represent chiefly different types of carbon brush-holder, all of which are being die-cast on a commercial scale. The design of the die is a most important factor, and here it is where experience is the best guide. The design of the part itself should conform to the special requirements of die-casting, and there is need for the closest co-operation between the engineer, metallurgist and foundry foreman. The number and shape of the parts of the die, method and order of withdrawing the cores, venting, situation, shape and size of the gate, all must be carefully considered in designing a new die.

COST OF PROCESS

No general rule can be laid down with regard to costs. In some cases die-casting is cheaper, in other cases dearer than sand-casting. The cost of dies, material, labor and machining must be gone into before a decision can be come to as to which is the more economical process. The cost of machining and assembling of the "Butterfly" type brush-holder above referred to is eight times as great when sand-cast as it is when die-cast, and the other parts shown are also cheaper die-cast. The castings are not sold by weight, as the cost of labor varies both in making the dies and castings. The die cost is treated as a separate item from that of the castings, and is generally borne directly by the customers.

DIE-CASTING ON A SCIENTIFIC BASIS.

For a scientific investigation into die-casting, the following might be carefully studied:

The alloy:

(1) Coefficient of expansion at different temperatures.
(2) Specific heat.
(3) Thermal conductivity.
(4) Mechanical properties at high temperatures.
(5) Mass, volume, and surface area of casting.
(6) Latent heat of fusion.
(7) Metallography.
(8) Pressure on metal in die.

The die-material:

(1) to (5) As above.
(6) Possible attack by molten alloy.

Casting conditions:

(1) Temperature of molten metal.
(2) Temperature of die.
(3) Length of time in die.
(4) Rate and method of cooling of casting.

Even with all the above information, however, it would still be necessary, in the case of a new part, to go on more or less empiric lines before a satisfactory casting could be produced.

It might be feasible to design a standard die which would serve as a basis for comparison of results obtained by different observers.

ALUMINUM IN NORWAY.

Norway, through its available water power, has become a large producer of aluminum. At present the British Aluminum Company has two factories in that country and the Compagnie Aluminum Francaise, one. Now the Norsk Aluminum Company has been established with a factory at Hoyanger, with a capital of $4,000,000, a water power of 21,000 kilowatts and an annual production capacity of 6,000 tons. Half of the plant is already in operation. The aluminum ore bauxite is obtained from France. The headquarters of the Norsk Company are in Christiania and the managers are S. Klaumann and Emil Collett, Ph. D. C. E.

ELECTRO-PLATING ENGINEERING

A Series of Articles Relating to the Operations and Equipment Employed in Electro-Plating and the Reasons Therefor—Seventh Paper. This Series Began in The Metal Industry, January, 1916.

Written for The Metal Industry by Charles Blake Willmore.

CHARLES B. WILLMORE.

CONDUCTIVITY OF PLATING SOLUTIONS.

We often hear platers speak of the conductivity of their solutions. They speak of certain salts as "conducting salts," which they add to the solution to improve its conductivity. Further, they say that a certain solution is superior to another because it has better conductivity. However, if one of them is asked for any data as to the conductivity of the solution in terms of electrical units, such data is not usually forthcoming, nor have I yet seen a practical plater who actually knew how to measure the conductivity of his solutions.

High conductivity in itself is not the determining factor of the excellence of a solution, as some seem to think. If it were, then the choice of solutions would be based on this property, and all solutions would be made to have the highest possible concentration, in order to secure maximum conductivity; whereas, in most cases the solutions of moderate concentration are the ones which give the best results. In this case, also the copper sulphate solution would give a very much better deposit than the copper cyanide solution, because its conductivity is much higher. It is true that certain salts when added to a solution will improve the deposit and improve the conductivity at the same time. But whether the higher conductivity is the cause of the improvement in the deposit, or is merely incidental to it, is a question which is by no means settled. The only way it can be settled is by the collection of a sufficient amount of actual data showing the relation, if any exists, between the conductivity of various solutions, measured in standard units and the other essential features of the solutions. By essential features, are meant such factors as rapidity of deposit, thickness of deposit, smoothness, adherence, porosity and toughness, all measured in such units that their meaning is readily understood by everyone.

The saving in electrical power gained by a small increase in conductivity is of slight importance in electroplating when compared with the character of the deposit. Hence, in the average plating room improvement of conductivity for the mere saving of power is not in itself a sufficient justification for the addition of conducting salts.

Since the matter of the conductivity of solutions is really a rather important one, it seems, therefore, that a description in this magazine of a simple, accurate, and convenient method for measuring conductivities would serve a useful purpose.

Conductance is just the opposite of resistance, or speaking mathematically, conductance is the reciprocal of resistance. That is, if a solution has a resistance of R ohms, its conductance K is equal to 1/R. The unit of conductance is called the reciprocal ohm, and is sometimes expressed by writing the word "ohm" backwards to form "mho." When we measure conductance, therefore, we really measure resistance, and take the reciprocal for our result.

The method of measuring resistance of a metal conductor already described, is to run a measured amount of current through the conductor, measure the voltage drop, and then solve the equation $R = \frac{E}{L}$. This method can also be used for measuring resistances of solutions, if proper allowance is made for another factor which usually interferes. This factor is the counter electromotive force, or back voltage. This counter electromotive force (counter e. m. f.) is due to the formation of a film of gas on the anode or cathode, or to differences in composition between the anode and cathode. For scientific purposes, this factor is eliminated by using alternating current for making the measurements. This, however, is a slow and tedious process and involves a comparatively elaborate apparatus. The simpler method is to measure the impressed voltage, and the counter e. m. f. and then subtract the counter e. m. f. from the total voltage between the electrodes, and use this result for solving the equation.

For accurate comparison between the resistances of different substances, the specific resistance or resistivity is used. The specific resistance, or the resistivity of a substance is defined as the resistance of a cube of the substance measuring 1 centimeter on a side. In electrical formulas this specific resistance is usually represented by the symbol *r*. For a conductor of length L, cm. cross sectional area of A sq. cm., and specific resistance *r*, the total resistance is $\frac{r \times L}{A}$.

For measuring the resistivity the following apparatus is needed: An ammeter with a small scale, say from 1 to 10, a voltmeter with a small scale, about 1 to 5, and graduated as finely as possible, a rheostat, a thermometer, and a small tank of certain definite dimensions, for holding the solution.

The size of this tank will depend upon the electrical instruments available; but for the instruments given above, the following inside dimensions are convenient: width 1¼ inches, depth 3 inches, length 15¾ inches. Around the inside of the tank draw a line ½ inch from the top edge. If the tank is held level and the solution is put in until it just meets this line, the solution will then have the following dimensions: cross sectional area, 20 square centimeters, and length 40 centimeters. The choice of these dimensions will simplify the calculation of the results, for if the measured resistance of the total solution is equal to R ohms, then the resistivity, *r*, is equal to one-half of R. The tank, if made of wood, should be boiled in paraffine before use, which will not only prevent loss of the solution, but will prevent the wood from soaking up the solution, in which case the wooden sides would also conduct part of the current, and thus make the results less accurate.

In making the measurements, two sheet metal electrodes, of the same metal as will be deposited from the solution, should be used. Both of these should be cut from the same sheet, to a size which will just fit into each end of the tank.

The connections for making the measurements are shown in figure 23 which is self explanatory. In order that the data obtained shall be comparable, all of the solutions should be measured while being maintained at some standard temperature. A convenient standard is 25 degrees centigrade, which is equal to 77 degrees fahrenheit. The solution can be brought to the proper temperature in a crock or kettle, and then poured into the small tank for measurement, as the actual measurement can be made in a short time before the temperature changes appreciably.

To make the measurements merely pass a current through until the voltmeter and ammeter readings become constant. Read and record the amperes and volts, and then watching the voltmeter needle closely, quickly open the switch and note the behavior of the voltmeter needle. If the needle hesitates at some point for a moment before returning to zero, the hesitation is due to a counter e. m. f. of polarization, which should be read and recorded. It may take a little practice in order to make accurate readings. As a check, the current should be varied and readings taken at different currents.

The data should be calculated according to the following formula:

$$R = \frac{E - P}{I}$$

, where I is the current in amperes, E is the total voltage, P is the counter e.m.f. and R is the

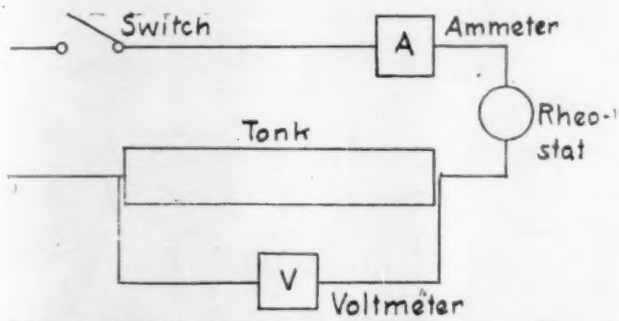


FIG. 23.—DIAGRAMMATIC SKETCH OF WIRING FOR MEASURING CONDUCTIVITY.

resistance in ohms. The resistivity *r* is equal to one-half of R if the dimensions of the solution are as given above.

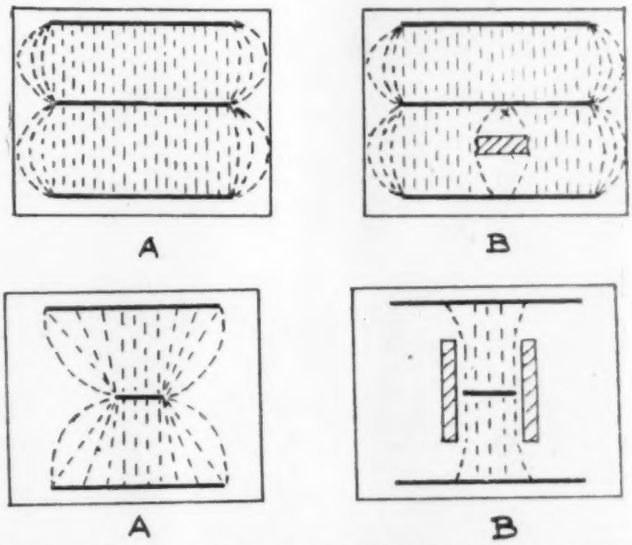
CURRENT PATHS IN THE SOLUTION.

In discussing the conductivity of the solution we should also take up the matter of the actual path of the current in travelling through the solution. In the small tank described in the above experiment, where the electrodes completely cover each end of the tank, the current travels in a perfectly straight line, and the current density is absolutely uniform over the entire exposed surface of both electrodes. This was necessary in order to permit accurate computation of the amount of current and voltage throughout a definite portion of the solution.

However, this ideal condition does not occur in regular plating baths. Where the electrodes are smaller than the cross section of the tank, the current does not all travel in straight lines, but instead some of it spreads out so as to fill the entire cross section of the solution, as shown in the top view of the tank in figure 23-A. An end view of the tank would show that the current lines also spread out to the bottom of the tank in a similar manner.

Suppose a piece of some non-conducting material should be suspended in the solution between the two electrodes. The paths of the current would then be similar to those shown in figure 24-B. This shows that in order for current to get to point X, it will have to follow a longer path than if it went directly between the two electrodes. Consequently, a comparatively small amount of the current goes to point x on the cathode, and the deposit is lighter over this area than at any other part of the cathode. In other words, the deposit has been "shaded" by placing a piece of non-conducting material in front of it. This device is useful where it is desired to put a comparatively heavy plate on one part of an article and have this heavy plate shade off into an ordinary plate on other parts of the article, as in plating tableware.

Figure 24-A explains why the corners and edges of a cathode always get a heavier plate than the rest of the object. The figure shows that the stray currents have a tendency to converge at these corners and edges. The smaller the cathode in proportion to the anodes, the more marked is this tendency to pile up on the corners, as figure 25-A shows. Hence, when a tank is being run at less than full capacity, the usual method used to prevent the work from burning at the edges is to hang an anode or a "bob" at each end of the row to take up this extra current. This means that a certain amount of power is being wasted on these extra pieces, and that the metal is being worked out of the solution to a greater extent



FIGS. 24 AND 25.—SKETCH SHOWING PATHS OF CURRENT IN ELECTROLYTIC SOLUTIONS.

than is necessary. In figure 25-B, which is a top view of the tank, are shown two plates of non-conducting material, such as glass, or paraffined wood, weighted down, which are placed at each end of the row of work and at right angles to the anode rods.

As shown in the diagram, this device cuts off most of the stray currents, which would otherwise travel to the end pieces of the row of work, from all the anodes not directly opposite the work. In other words, to a certain extent it forces the current to travel in straight lines between the cathode and that part of the anode surface directly opposite the cathode. This means a much more even distribution and very little excess current on the end of the row of work. This object is attained just as effectively as by hanging anodes at these points, and without any waste of power or metal.

(To be continued)

MELTING BRASS IN THE CATSKILL MOUNTAINS

The furnace shown in Figure 1 is not the latest type of a coal, gas or electric melter, but illustrates the way that brass is run down in one of the little villages of the Catskill Mountains.

It was designed and built by C. D. Gilbert and is operated by him at the plant of the Margaretville Foundry

THE BRASS MELTING CUPOLA AND MELTER.

Company, Margaretville, Delaware County, N. Y., A. Matino, proprietor. Mr. Gilbert reports that he melts from three to four tons of metal per month and from five to six hundred pounds of metal per heat. The furnace requires a forced draft and there is a loss of fifteen pounds of metal to every hundred melted.

Mr. Gilbert's castings are mainly the engine boxes for the Delaware and Northern Railroad and weigh from ten to a hundred pounds apiece. His railroad box mix is 60 copper and 40 zinc and the melt takes less than an hour's time, using coke or coal for fuel.

As will be seen in the cut, the Gilbert furnace is virtually a cupola, the bottom part being built of an old boiler, the top of a discarded stove, the oven door having been taken off to allow for the feeding of fuel and metal. The resulting alloy is drawn off from the bottom in the same way that a cupola is tapped.

It will be seen from the photograph that the brass furnace is outside of the foundry—all melts are in the open, while the iron cupola is enclosed in an old wooden structure, 28′ x 50′, two stories, with a pattern shop upstairs. The run from the iron cupola is from five to six tons per week.

The picture also shows how the trees are growing beside the foundry building and the great quantity of old iron in the foundry yard. Some of the scrap contains

THE METAL ROOM AND FOUNDRY.

fine specimens of the ornamental stove designs of earlier days. They now look like antiques and if sent to some of the antique stores in our larger cities might bring fancy prices, but at present they are going into the cupola.

It takes five able bodied men to run the foundry, and when business will not keep them going all they have to do for a diversion is to take their fishing rods and catch trout in the east branch of the Delaware River, which runs by the door.

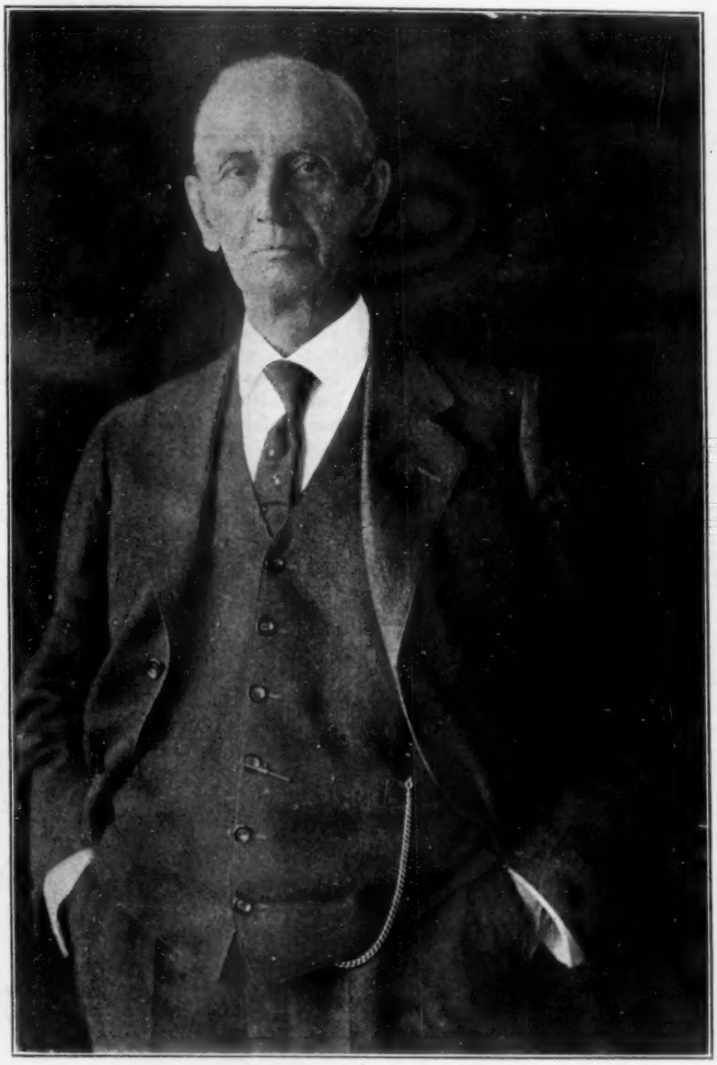
Mr. Gilbert is seen standing beside his brass furnace. He naturally takes to the foundry business as he comes from a foundry family, his father having built the shop fifty years ago and the present Gilbert has two sons who work at the same craft, one having a foundry of his own in another Catskill mountain town.

THE METAL INDUSTRY is not aware that the Gilbert furnace has any competitors, so it has everything its own way in melting brass in Margaretville.

CHAUNCEY P. GOSS

PROMINENT METAL MANUFACTURER AND PRESIDENT OF SCOVILL MANUFACTURING COMPANY, WATERBURY, CONN., DIES AFTER A BRIEF ILLNESS.

Chauncey P. Goss, president of the Scovill Manufacturing Company, died at his home at the corner of Hillside avenue and Pine street, Waterbury, Conn., on July 19, after an illness of several weeks, at the age of nearly 80 years. He has been failing in health of late, and when he returned from his winter in the South on May 22, he was attended by a physician. But he was at the office of the Scovill Company only three weeks ago and has been able to ride out every day up to within a very short time. The funeral was held at the First Church at Waterbury, Conn., on Sunday, July 21, and was attended by a great number of people, including a large portion of the employees of the Scovill Company. The funeral services were most impressive. The honorary pall bearers were close personal and business friends of Mr. Goss, while the active bearers included members of the executive staff of the Scovill Company.



CHAUNCEY PORTER GOSS.

Chauncey Porter Goss was born in Pittsford, N. Y., on August 5, 1838, and was the son of Ephraim and Margaret (Porter) Goss, his father being an attorney at law of Pittsford, and a man of marked ability in his profession. In his boyhood, Mr. Goss attended the public schools, later taking a night school course. His first business experience was as a clerk in a country store in his native town, and later he worked on the canal, making a special business of buying produce, and winning success in that line, showing the business ability which characterized his later years even at this yearly period.

In 1862 he came to Waterbury, believing that he would find here better opportunities, and entered the office of the Scovill Manufacturing Company as office boy and assistant bookkeeper. The same year he became bookkeeper, and when the former bookkeeper died, in 1864, he was chosen secretary, holding this position until 1869. In 1866 the duties of treasurer were added, and in 1900 he was chosen president of the concern; continuing to hold the offices of president and treasurer until the last annual meeting, when he was continued as president and his eldest son, Edward O. Goss, was made treasurer.

It is said of him that "he has made a splendid executive officer. His has never been the command of the tyrant to go, but the call of the leader to come. An excellent judge of men, he has been able to gather around him a corps of most efficient assistants. Moreover it has ever been his custom to study closely every phase of the business, and until recent years he has had remarkable knowledge not only of the principal points, but of the details connected with this mammoth manufacturing concern, and his ability along mechanical lines has been shown by his inventions. As the Scovill Manufacturing Company is the largest of its kind, having enjoyed phenomenal growth, and as the business constitutes a most important chapter in the records of business development in Waterbury, Mr. Goss should be honored with a prominent place among Waterbury's citizens.

In 1864, Mr. Goss married Miss Caroline Amelia Ketcham, of Bushnell Basin, N. Y., who died in 1915. Mr. and Mrs. Goss were the parents of seven children: Edward Otis, Margaret Porter, who died when three years of age, Caroline Ryan, wife of Hugh L. Thompson, Mary Elizabeth, wife of William Kelley-Patterson, a British officer now at the front, John Henry, Chauncey Porter, Jr., and George Augustus. With the exception of Mrs. Kelley-Patterson, who resides in Surrey, England, and Captain George A. Goss, who is now serving in France, all are residents of Waterbury, Edward O., John H. and Chauncey P. being connected with the Scovill Manufacturing Company in important official capacities. There are a number of grandchildren.

Mr. Goss and his family were long identified with the First Church as active and helpful members. He often served on important committees, and contributed in many ways to the extension of its influence. He was especially interested in educational matters, being president of the board of directors of the old Hillside Avenue School, and also one of the incorporators of the English

and Classical School and serving on its first executive board. He had a beautiful home in Aiken, S. C., where he has spent the winters of the past five years and where he found great enjoyment in life though always impatient to get back into the harness again at home. He was devoted to his wife during several years of invalidism and greatly missed her when she died three years ago. He was of tall imposing figure, of large but never bulky frame, straight and unbent even to the end, serious in manner, grave of countenance, but with a rare and pleasant smile, a humorous twinkle of the dark commanding eye—the look and manner of a man of power with the ameliorating spirit of a friendly neighbor, interested citizen, homeloving husband and father.

In 1912 Mr. Goss completed 50 years of service with the Scovill Company and this brought him into the small coteries of men who had been connected with the metal industry for half a century. A complete description of his career was given in THE METAL INDUSTRY for February, 1912, thus making three men who had been similarly described. The other two fifty-year men were T. G. Locker, a Birmingham, England, metal manager, published in May, 1908, and Charles F. Brooker, President of the American Brass Company, which appeared in May, 1914.

Mr. Locker died in July, 1911, and now Mr. Goss has passed away, leaving Mr. Brooker the only one of the trio still living.

BRASS MAN GETS LIBERTY MEDAL

The first Liberty Service Medal to be awarded in Connecticut by the Liberty Medal Committee of the National Institute of Social Science has been awarded to John H. Goss, general superintendent of the Scovill Manufacturing Company, of Waterbury, Conn. Mr. Goss is a son of C. P. Goss, the president of the company, whose death is recorded on this and the preceding page.

This medal of bronze, of a handsome design as shown in the photograph, is bestowed by the Society upon such person or persons who have rendered or may render notable services which merit such special mark of distinction and recognition. The medal was awarded to Mr. Goss for:

OBVERSE AND REVERSE SIDES OF BRONZE MEADAL AWARDED TO J. H. GOSS, OF WATERBURY, CONN., BY THE NATIONAL INSTITUTE OF SOCIAL SCIENCE.

> "His personal interest in his employees and vigilance in securing for them favorable conditions in work and development by which he not only kept the community free from disturbances at a time of grave national peril, but prepared the way along which peaceful solutions may be attained to problems arising after the war."

In accepting the medal, Mr. Goss gracefully protested against accepting entire credit for the results obtained by his work which led up to the awarding of the medal and thanked the society for himself and the thirteen thousand workers who are under his direction at the Scovill works.

Mr. Goss said in his letter of acceptance to the Secretary of the National Institute of Social Science:

"Permit me to say that while it may appear to have been due to my effort that success has been attained in maintaining industrial peace in the organization and community to which I am attached, it has been not so much due to personal ability of mine as to the fact that I am titular head of the working force of a large industrial plant which had acquired long before I became connected with it, a great prestige in the industrial world, due to fair dealing with all. Naturally, all of us composing its organization become imbued with its spirit and are impelled with a desire to help maintain the traditions of our company.

"You will pardon me, then, if I feel that my medal belongs also to that great group of over 13,000 workers who are putting forth their best efforts at this time, particularly when their country solely needs all and more than they can produce to win this war. It is to me a wonderful exhibition of patriotic endeavor. It might so easily have been otherwise had they not the capacity to assimilate so many new elements. That is a tremendous combination of force to have always standing back of me.

"May I not, then, accept this honor with sincere appreciation both for them and for myself, because we always work together in these things, and whatever is accomplished is accomplished as a result of team play. With this graceful tribute from your council to our efforts of the past we will continue to 'carry on' with even keener zest."

JOHN H. GOSS.

EDITORIAL

Vol. 16 New York, August, 1918 No. 8

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW.
Published Monthly

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CONTENTS

CADMIUM IN BRASS

The last word regarding the effects of cadmium on high grade brass seems to have been spoken. Some notes on the influence of cadmium on the properties of copper zinc alloys by M. Léon Guillet have recently been presented to the French Academy of Sciences. The investigation was prompted by the fact that certain small consignments of zinc recently delivered to France showed traces of cadmium. The brasses experimented on contained 70 and 60 per cent. respectively of copper and a quantity of cadmium varying from 0 to 40 per cent. The author arrives at the following conclusions: (1) Cadmium only affects the mechanical properties of brasses containing 70 and 60 per cent. copper when present to the extent of at least 1 per cent. (2) The effect is apparent beforehand by a decrease in the resilience of the alloy. (3 The elongation revealed by tensile tests is only diminished when the cadmium content reaches 2 per cent. (4) Modifications in the mechanical properties correspond to the appearance of free cadmium which forms (at the beginning, at any rate) a very clear filament around the grains of the metal. With 2 per cent. cadmium the cadmium is isolated, like lead, in round grains. (5) Cadmium thus enters into solution in the normal constituents of brasses when the alloy contains not more than 1 per cent. of this element. (6) In the industrial manufacture of brasses the presence of cadmium should only be considered detrimental if present to the extent of more than 1 per cent.—which rarely occurs.

In a report made in the name of nine of the important spelter producers by W. R. Ingalls to B. M. Baruch, chairman of the Committee on Raw Materials of the War Industries Board, the same conclusions in favor of cadmium are reached. This report was published in THE METAL INDUSTRY, April, 1918, and the final recommendations are so interesting that we reproduce them here:

"The French Government has supplied American contractors for cartridge disks with large quantities of spelter containing up to 0.4 per cent lead plus iron, without any specification as to cadmium. The British Government, which in the early years of the war, required high grade spelter, has recently liberalized its specifications and for cartridge brass now takes spelter containing up to 0.3 per cent lead and does not stipulate anything as to cadmium. American producers have supplied both of these governments, and also the Russian and Italian, with large quantities of such spelter, without receiving any complaint. If the manufacture of cartridge brass during the war had been limited to high grade spelter the supply would have been far from sufficient.

"Finally, and most conclusively, the brass committee of the Advisory Council of National Defense, compris-

ing the leading brass manufacturers of the United States, advised the United States Government that, with the use of spelter containing not more than 0.10 per cent to 0.12 per cent lead, 0.02 per cent iron, and up to 0.5 per cent cadmium, they could make good cartridge brass. They included brands of spelter refined by redistillation among those which they considered suitable. This recommendation by the brass committee is in itself considered a sufficient reason for the liberalizing of the spelter specifications of the United States, and by comparison with what the French and British are actually doing is regarded as being very conservative. Indeed, such spelter will make brass coming within the limits of toleration of impurities in the existing specifications of the ordnance department of the Army of the United States."

THE METAL INDUSTRY in July, 1916, published an editorial in which the writer recorded his experiences with cadmium in brass which began in 1896 and extended over a number of years. The results there are now corroborated by these later investigations. THE METAL INDUSTRY for October, 1916, contained a paper presented by W. R. Ingalls before the British Institute of Metals in which Mr. Ingalls came to the same conclusion.

As a matter of fact, metallurgists who had given the matter any consideration at all long ago decided that spelter containing anything less than 1 per cent. of cadmium was suitable for brass, even requiring deep draws or for spinning purposes. It was only at the beginning of the war when a great demand was made for large amounts of cartridge brass that the question came up with new force and some drastic specifications were drawn which were possibly slightly influenced by smelters whose spelter contained no cadmium. It seems to be definitely settled now that upwards of one per cent. of cadmium contained in spelter has no deleterious effects on high grade brass, but there is a growing belief that it may be beneficial! We are glad that conclusions reached over twenty years ago are now justified.

HOLD YOUR LIBERTY BONDS

To successfully finance the war it is necessary that owners of Liberty bonds hold their bonds if possible. Where for any good reason it is necessary for them to turn their bonds into cash they should seek the advice of their bankers.

Liberty loan bonds are very desirable investments, and crafty individuals are using various means to secure them from owners not familiar with stock values and like matters. One method is to offer to exchange for Liberty bonds stocks or bonds of doubtful organizations represented as returning a much higher income than the bonds.

There are various other methods used and likely to be used, some of the gold-brick variety and others less crude and probably within the limits of the law. All offers for Liberty bonds except for money and at market value should be scrutinized carefully. The bonds are the safest of investments and have nontaxable and other valuable features.

To hold your Liberty loan bonds, if possible, is patriotic. To consult your bankers before selling them is wise.

THE BELLS OF BELGIUM

Ten thousand bells of Belgium rang their message o'er and o'er;
Five hundred years they called to prayer, now silent evermore.
No more will Antwerp, Bruges, and Ghent awaken by their chimes,
For the bells, like men, have suffered from the Hun's unheard-of crimes.

Ten thousand bells of Belgium have been melted up for guns;
Not even altar vessels have been sacred to the Huns.
Their metal, mixed with base alloy, is shot at Belgian men,
With the Hun's cold sneer, "The Belgians shall have their bells again!"

O captive bells of Belgium, it's not your fault, we know,
That you pierce the hearts and take the lives of those who love you so.
At least you're buried with the slain, in the soil you love so well;
Those saved, put back when war is done, will ring the Hun's death knell.

Our silver, gold and copper from America's far mines
We gladly offer for new bells to voice your pillaged shrines.
When Belgium blocked the Hun advance and said, *"Halt! Here you stop!"*
You won our hearts' devotion to the last pulsating drop.

The plots of lying Huns shall not Walloon from Fleming cleave;
Your hearts knit so firm by love the Hun cannot deceive.
As metal of ten thousand bells together now has run,
So the fires of German baseness have fused all hearts as one.

God bless the Huguenot and Catholic, and loyal Hebrew, too;
King Albert, Cardinal Mercier, we bow our hearts to you!
We join with Caesar—"Belgians are the bravest of the brave";
You gave your all for Freedom, the whole wide world to save.

The children in all schools have learned, and e'en the youngest knows,
How every Belgian faced the Huns and stopped five million foes;
Henceforth all lands and farthest isles, wherever mankind dwells,
Will recall the bells of Belgium, when they hear their own church bells.

JAMES HENRY DARLINGTON,
Bishop of Harrisburg, Pa.

The New York *Times*, July 24, 1918.

PATRIOTISM WITHOUT HESITATION

If our soldier boys deliberated as long over doing their duty as some of our people at home hesitate over doing theirs, the victory would be doubtful.

It is a sort of financial cowardice to hesitate to put your money in United States Government securities, and to deliberate over the wisdom and patriotism of the investment is to hesitate in supporting our soldiers.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

VOCATIONAL EDUCATION FOR WAR CRIPPLES

To the Editor of The Metal Industry:

Congress, without dissenting vote, has delegated to the Federal Board for Vocational Education the great task of re-educating and rehabilitating for civil life and usefulness such of our wounded soldiers and sailors as may be proper subjects.

Available statistics show the number to average about 10,000 per million men per annum. In other words, on the present army and navy strength, together with auxiliaries, we are certain of almost 30,000 men to be subjects for re-education this year. As the strength grows, the number of men grows. With the more sanguinary nature of the fighting in open warfare instead of trench stalemate, the average may run to higher figures.

Experience of our Allies shows that over 80 per cent. of permanently disabled men can be re-educated for useful, self-sustaining, wage-earning employment. Many of them will be made into expert artisans, mechanics and semi-professionals, and will be a most valuable asset to the country in carrying on the work back of the lines, releasing able-bodied men for the front; and also of great use to the country in the civil readjustments after the war when the depleted ranks of skilled men will not be able to supply the demand.

The work is of intense interest to every man in the ranks, every man subject to draft, and the families and relatives of these men, and to Americans generally. To know that even though broken and shattered in the fighting, there does not exist a future of inadequately pensioned, idle days, or an occupation that is semi-mendicancy, but that the disabled man may be fitted for useful, respectable wage-earning occupation, and in many instances will make more than he ever made before he was hurt, should add strength to their arms and resolution to their course. It should comfort them and their families, and make those who are not privileged to bear arms feel that our country is acting with high justice toward the men who are bearing the brunt.

We are not perparing any "handouts," nor conducting propaganda, but we do want the people to know what is going to be done for the wounded, so as to educate public sentiment toward requiring these men to take the training for their own sake. It is entirely voluntary on the part of the wounded man whether he takes it or not. It is there for him, to take or leave, just as he wishes. But a public sentiment understanding the opportunity, will help reduce the number of crippled and shattered incompetents after the war. The training does not affect his allotment under the War Risk Insurance.

C. A. Prosser,
Director of Federal Board
for Vocational Education.

Washington, D. C., June 26, 1918.

TRADES PREPARING FOR FOURTH LIBERTY LOAN

The United States will next month call upon the men and women of this country to support a great government loan to aid in winning the war. The issue of bonds for the Fourth Liberty Loan will equal or exceed $6,000,000,000. The tentative date for opening the sale of the new certificates is September 28. It will continue about three weeks.

It has been stated that the nation's war programme will necessitate the expenditure of $24,000,000,000 during the fiscal year ending June 30, 1919. This money will be raised in two ways; by taxation and by the issue of bonds.

Taxes of all kinds added $4,000,000,000 to the nation's treasury during the past fiscal year, when total expenses were between twelve and thirteen billion dollars. We cannot contemplate doubling the national budget without increasing the tax income in the same ratios. Plans are now under way to make substantial additions to the amounts derived from war profits and personal incomes. Should these additions swell the tax returns to $8,000,000,000, there would still be left twice this amount to be raised by the sale of bonds.

Enormous as this sum appears on paper, it still barely scratches the surface of our national resources, which, as Thomas W. Lamont recently pointed out, were estimated at the beginning of the war at $250,000,000,000. The total amount derived from sale of government securities to date is $9,978,785,800.

Without making any rash promises for the future or attempting to paint the chances of the Allies in too rosy colors, there is a possibility that this may be a "Victory Loan." Nearly 1,500,000 United States soldiers are now in France. More are landing every day. The way the Yanks beat back the Germans during the July drive and their earlier victories at Cantigny and Belleau Wood, together with the successes of the French and British, are sure signs, military experts say, that the fortunes of war have probably swung our way.

The industrial workers of the country will play a more important part than ever before in raising the new loan. They have profited largely through the war. In many cases, increased wages have far outstripped the advanced cost of living so that the so-called "working man" is actually in better circumstances now than he was before the world conflict. He will be called upon to meet his obligations to the government in full.

Concerted efforts will be made all over the nation to canvass every industry. This is specially true in the Second Federal Reserve District where a remarkable organization has been built up to secure subscriptions in New York City. This organization is known as the Rainbow Division. It is composed of trade committees, representing every industry in the metropolis. The Division accounted for $409,367,150—more than one-third of the city's quota—in the Second Loan. In the Third Loan, this sum was bettered by $155,399,950. Still further progress is expected during the coming campaign because of the finely perfected organization of the Advisory Trades Committee—the executive or directing committee of the Rainbow Division.

The Advisory Trades Committee is headed by G. deB. Greene of the firm of E. H. Rollins & Sons, of 43 Exchange Place. Mr. Greene, chairman, and Craig Colgate, vice-chairman, have obtained a record and rating of every business house in the city. There will be in the neighborhood of 100 sub-committees, each representing a trade canvassing for subscriptions. When these committees begin work late in September, each will be supplied with a list of names of every firm to be visited. One advantage of this listing is that it will prevent the work of committees from overlapping. Another is that it will make easier their work and insure that the full period of the campaign is devoted to actual canvassing rather than organizing. This trade list will give the number of employees in every industrial house in New York City.

The personnel of all the committees is not yet complete. Each will have a chairman, appointed by Governor Benjamin Strong, of the Federal Reserve Bank of New York. The chairman will meet then select his own co-workers.

Should the government call for $6,000,000,000, every committee will have to double its quota allotment of the Third Loan. At the beginning of the Third Loan, all the committees were divided into three groups or classes: those expected to raise $10,000,000 or over; those expected to raise from $2,000,000 to $10,000,000 and those expected to raise under $2,000,000. This plan was a great success and caused considerable friendly rivalry among the various committee teams.

Rivalry was further stimulated by the awarding of Honor Flags to firms, sixty per cent. of whose members and employees had bought bonds. Five thousand of these flags were awarded. More than fifteen hundred of the firms earned 100 per cent. Honor Flags—that is, every worker in the concern subscribed to the loan. The Honor Flag system will undoubtedly be a part of the coming drive.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ALLOYING

Q.—Would you be kind enough to inform me whether you have any formulae in your file for making a non-shrinkable metal for duplicating patterns?

A.—The most satisfactory and generally reliable metal for patterns is the following:

Zinc	50
Tin	50

While the cost of this alloy is high at present it can be used repeatedly and patterns not in active use may be melted up again, the melting loss being negligible because of the low melting point of the alloy. Its specific gravity is low also so that weight for weight it will go further than the lead base alloys that are often used for patterns. It is also superior in hardness to most of these alloys.

Strictly speaking there is no such thing as a non-shrinking alloy. By pouring the above alloy at a low temperature its shrinkage is very low. The small amounts of bismuth or cadmium that are usually added to lead base alloys, have no appreciable effect on their shrinkage. If these additions are increased to 10 or 15 per cent. or to a sufficient extent to cause the alloy to expand in the mold on setting and give castings of a sharp outline, the cost of the alloy will be very much increased. It will also be found that if the shrinkage is measured by casting a bar from a pattern that is exactly 12 inches by 1 inch by 1 inch, that there will still be a very considerable shrinkage in the alloys. Hence, the tin-zinc alloy given is to be preferred to alloy of this kind.—J. L. J. Problem 2,603.

CASTING

Q.—As you of course know, all manufacturers are having more or less trouble in getting the tin required for brass foundry use in these times. We understand that some firms are substituting some other hardener in place of the tin and would thank you for any information you might be able to give us along this line of what might be used in place of the tin and what would be the limit amount of same to be used and whether it would be suitable for valve bodies. Our bronze in these bodies is composed of 85 to 88 per cent. copper.

A.—Notwithstanding the scarcity of tin and its high price no substitute has been offered for it. Straits tin has not been obtainable as a rule, but some users have been able to cover their needs by getting American made electrolytic tin, which they report to be equal or superior to Straits tin. Considerable 99 per cent. tin has been offered and as the principal impurity in it is lead, this grade of tin can be used for nearly every purpose.

Some makers of valves and fittings have tried to substitute antimony for a portion of the tin in their mixtures and while at first this substitution appeared satisfactory after several remeltings, it was found that antimony was as bad as aluminum in such mixtures.

Nearly all brass founders have slightly reduced the tin content of their mixtures. Users of 88-10-2 are in some cases going to 85-5-5-5. The following mixture is also largely used.

Copper	73.00
Tin	1.75
Lead	6.75
Zinc	18.50

By careful attention to pouring temperatures, an alloy of even higher zinc content may be used in valves and fittings. Where a firm is equipped with a chemical laboratory the tin required in a mixture may be obtained from scrap very cheaply instead of by using pig tin.—J. L. J. Problem 2,604.

FORGING

Q.—The writer is very much interested in die pressed or brass forging parts which seem to be coming into more or less use. Would appreciate it if you would kindly send me the formula for doing this operation, that is, taking the metal from the rough or raw state and giving each operation until the finished article is produced?

A.—In a general way it may be said that the alloys used for pressed brass parts consist of from 57 to 65 per cent. of copper and the rest zinc. Manganese bronze and aluminum bronze have also been used to a limited extent. In some cases sand castings have been made of these last alloys, somewhat larger in size than required in the finished piece and these castings have been die pressed.

The cost of dies is considerable and unless an article is wanted in lots of 5,000 or more, it is seldom economical to use pressed brass. The parts made by this method commercially at the present time are rather simple and complicated shapes are seldom attempted. The fittings for high pressure hydrogen and oxygen tanks are articles that are better made from pressed brass than from any other material.

Slow working presses would give a very limited production and hence it is necessary that the presses for this process should be rapid.

It is also found in practice that the process does not produce parts that are close enough to the required size to be used without machining except in a few cases. Hence, it may be said that pressed brass is likely to have a rather restricted use and it is likely to be specified only where great strength and density is needed.—J. L. J. Problem 2,605.

PLATING

Q.—We have had the misfortune of getting copper cyanide in our nickel solution. The plating-room helper forgot to dip the work in the cold-water tank before placing same back in the nickel tank. Can you advise me as to how to remove the copper cyanide from the nickel solution?

A.—It is difficult to remove copper from a nickel solution. However, the best method would be to add a ⅛ of an ounce of sulphuric acid per gallon of water and then get some clean sheet steel, which may be as thin as possible and have as large a surface as possible. Hang these sheets in your nickel solution, supported by iron wires to your work poles, every night and during the day when possible, but do not use any current.

It is a well-known fact that iron becomes coated with copper in a very dilute solution of sulphate of copper; therefore, if your nickel solution is very slightly acid the copper will deposit out upon the sheet steel. This is the most successful method we know of.—C. H. P. Problem 2,606.

Q.—Will you kindly let us have a formula for a light and dark green gold plating on steel, without the use of gold, also solution for depositing a smut.

A.—Light green gold is produced by the addition of silver to fine gold, either in solution or as an alloy. Dark green gold is practically a light green gold in solution, with the addition of arsenic dissolved in caustic soda, or sugar of lead dissolved in the same material. The arsenic or lead gives the black smut to dark green gold.

To produce imitations of these green-gold finishes on steel without the use of gold, you would have to use a brass solution that will give a greenish tint, and then apply the coloring agent afterwards. A solution for this purpose should be composed of the following materials and should be used as a still solution.

Water	1	gallon
Sodium cyanide	4¾	ounces
Copper cyanide	3	ounces
Zinc cyanide	1	ounce

Soda ash	2 ounces
Sal ammoniac	⅓ ounce

Use brass anodes of a mixture of 70 per cent. copper and 30 per cent. zinc. The addition of a little chloride of nickel to the brass solution will help to give a greenish brass tone, but an addition of not more than ¼ ounce per gallon at each time.

To give a smut for light green-gold finish after brass plating, the hyposulphite of soda and sugar of lead immersion solution should give good results. The proportions of such a solution should be as follows:

Water	1 gallon
Hyposulphite of soda	8 ounces
Sugar of lead	2 ounces

The solution should be used at a temperature of 200 degrees Fahr., and the articles should be immersed until the color desired is obtained. The solution gives a variety of shades, the final being a gray black.

Other smuts may be obtained from adding carbonate of copper mixed with ammonia to a dilute nickel solution, or a saturated solution of arsenic and caustic soda to a dilute copper cyanide solution using sheet steel anodes.—C. H. P. Problem 2,607.

REDUCING

Q.—Can you supply us with a formula for an acid mixture for reducing by a few thousandths, the size of some taps which we have which are cutting larger than desired?

A.—We are not aware of any formula for an acid solution for reducing the diameter of taps, as it would not be practical. If a strong acid was used it would be liable to eat away the metal at some parts more than others.

We would suggest that in order to reduce the diameter of the taps that you lap them by using carborundum and oil and a split adjustable collar to take up the wear when lapping. Use the best grade of non-shrinkable tool steel, which we believe will overcome your trouble of expansion.—P. W. B. Problem 2,608.

REFINING

Q.—Can you tell us how to remove traces of lead from copper? The effect of the lead in the alloy is to cause splitting in rolling, and we believe this is due to the presence of lead.

A.—The removal of lead from copper can best be effected by the usual refining method of "rabbling" the molten copper in a reverberatory refining furnace until the lead has been converted into oxide. The oxide of lead, together with some oxide of copper, will combine with silica from the furnace-lining, and be thus converted into slag, which can be removed by skimming.

If your copper contains only traces of lead, and has not been cast in a refinery where the process allows of the retention of some cuprous oxide to neutralize the harmful action of the lead, it will be necessary to remelt and allow of the introduction of some cuprous oxide. This is known as producing "Tough-pitch" copper, and should be entrusted to a skilled refiner. Possibly there are impurities in the copper other than lead. You do not give an analysis of the metal, without which it is not possible to give the best advice.—W. T. F. Problem 2,609.

ROLLING

Q.—In melting scrap copper and rolling into bars we have trouble in being unable to roll the bars without cracking. Can you inform us how to melt this scrap copper so that it will come out smooth?

A.—The probable reason for the copper bars to crack in rolling is that the metal has been rendered cold short or brittle due to the presence of copper oxide formed either in your process of melting or present in the scrap copper before you melted it.

While it is possible to melt scrap copper in such a way as to produce satisfactory solid copper castings by the aid of various deoxidizers which are on the market, by far the most satisfactory practice is to start with virgin metal.

The production of a copper casting free from oxide starting with all scrap is a metallurgical operation and should not be attempted without obtaining metallurgical help.

Good results may be obtained by using 75 per cent. of new copper and 25 per cent. of the scrap, provided the scrap is clean and free from oxide, but even then it will be necessary to so treat the copper as to reduce, before pouring, any oxide that remains dissolved in the copper. This operation in small quantities can be effected, as said above, by the aid of such deoxidizers as manganese, silicon, or prosphor copper. If you are not equipped with metallurgical talent it will be a difficult, if not impossible, operation to get results with all scrap copper.

If you had enough scrap copper to operate a small reverberatory furnace holding about 3,000 to 5,000 pounds you could, by hiring an expert copper smelter, advantageously handle the scrap copper, but if, as we understand your problem, you only have a small amount now and then, we believe it would be much more to your advantage to melt new copper and use up your scrap a little at a time in each heat.

In melting new copper in the gas furnace it is advisable to keep the copper covered at all times with a thick layer of charcoal and then just before pouring the deoxidizer, as mentioned above, may be added and the whole bath vigorously stirred. The procedure will not be sufficient for a crucible full of all scrap copper.

In using new coper, if you wish your resultant bars to be made into material for electrical purposes, it would be necessary to use a good brand of copper, such as that known as electrolytically refined, but if no electrical requirements are necessary a good brand of casting copper can be successfully employed.—K. Problem 2,610.

SHRINKING

Q.—I am having trouble with some plates about 18 inches in diameter and 3/16 inches thick. These castings look all right on leaving the foundry, but after machining it is found that the metal has separated in the center over an area of about 10 inches. The mold is rammed in the usual way. There is a very light job cast before these plates that calls for the metal to be very hot. The mixture is about:

Copper	85
Lead	1½
Tin	2½
Zinc	11

I would like to know the cause of this separation?

A.—We have seen pots about 30 inches high, 18 inches in diameter and with ¾ inch thick walls, made in cast copper that showed the separation to which you refer in a very marked degree. When these pots were cut up into rings, the rings from the center of the pots would separate, each forming two distinct rings. The remedy was found to be feeding by four very heavy blind risers cut into the top part of the castings.

As feeding may be done equally well by either a chill or a riser, in the case of the plates referred to, a chill on the bottom would no doubt do away with the shrinkages cavity that has been causing your trouble.

Before resorting to the chilling, however, you might try cooling the metal as much as is safe and then pour with very heavy gates and as quickly as possible. By this procedure the casting would set quickly and there would be less chance for a shrinkage cavity to form.—J. L. J. problem 2,611.

TUMBLING

Q.—We have some plungers which we wish to tumble in graphite in a tumbling barrel; that is, the inside of the plunger must have a coating of graphite. Can you suggest a method whereby this can be done?

A.—You have a somewhat difficult problem to coat the inside of the steel plunger with graphite by tumbling in a barrel. The only suggestion that we can make that appears to us as being practical would be to use ordinary lead buckshot and finely divided graphite. The buckshot and small amounts of graphite would, in our opinion, coat the inside and outside of the plunger satisfactorily. The speed of rotation of the barrel will have to be determined by experimenting.—C. H. P. Problem 2,612.

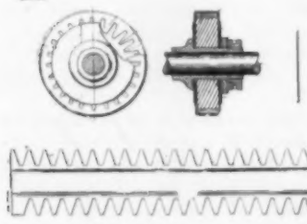
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,266,932. May 21, 1918. **Burnishing Wheel.** S. B. Frederick, Detroit, Michigan.

This invention relates to burnishing wheels and bands therefor to be used in burnishing leather boots and shoes.

The object of the invention is to provide a burnishing band shaped to conform to the shape of the ordinary burnishing wheel, adapted to be readily inserted over or removed from said wheel without removing the wheel from the shaft on which it is mounted.



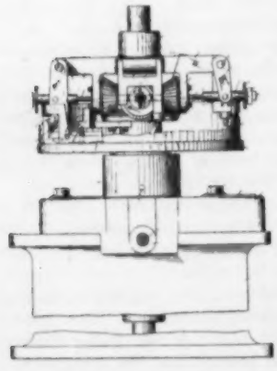
A further object of the invention is to provide a retaining plate to securely hold said band to the burnishing wheel and which may be sprung over the shaft into operative position, all as shown in the cut.

The patent covers: In a burnishing band holder, the combination of a burnishing wheel, a leather band having its edges notched to form tongues, said tongues turned down at right angles to the burnishing surface of said band, retaining plates cut through at one point and having their edges turned in to form a rim and means for pressing said retaining plates against said tongues.

1,267,634. May 28, 1918. **Buffing-Machine.** Simon Cooper of New York, N. Y., assignor to Brass Goods Manufacturing Company of Brooklyn, N. Y.

This invention has for its object to provide a machine, as shown in cut, for automatically, economically and expeditiously polishing or otherwise treating objects such as can tops and the like, and particularly objects of an irregular or unusual shape such as the elliptical form of tops now used to a large extent on toilet powder cans.

A special object is to insure the reaching of all portions of the articles by the polishing or other finishing device.



Other objects are to firmly hold the articles being worked on and to enable the setting of the machine to meet different requirements.

In the accomplishment of the foregoing there is employed a rotating turret for carrying the articles past the polishing or other device or devices and provide special means for holding the articles properly related to such device or devices. The turret is given an intermittent motion by special locking and tripping devices and the article supports are given a movement toward and away from the finishing device or devices.

1,267,669. May 28, 1918. **Process of Producing a Hard Copper Alloy.** Oscar C. M. Kundsen, Brooklyn, N. Y.

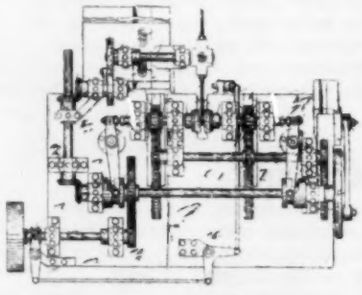
The present invention relates to a novel process of producing a hard copper alloy, said alloy consisting chiefly of copper and a relatively small percentage of aluminum.

In carrying out the process, from 12 to 14 per cent. of aluminum is used according to the grade of metals used, and according to the degree of hardness desired, the balance of the alloy (from 86 to 88 per cent.) being copper in its pure or commercial form. The aluminum is melted in a crucible, and after being melted has added thereto, the unmelted copper, which is broken up in small particles. The temperature is then increased to or slightly above the melting point of copper, and during the increase in temperature, the particles of copper are thoroughly mixed or stirred with the molten aluminum, whereby as the temperature of the aluminum increases to the melting point of copper, the copper will be thoroughly admixed with the aluminum. It is the addition of the particles of copper in unmelted state with the molten aluminum and the mixing thereof together, which has been found to result in the superior hardening of the alloy when it cools. It has been found that the mixing of the two molten metals together, or the mixing of aluminum with molten copper does not produce the results obtained by the present process. The molten alloy can be rolled, forged or otherwise worked while still hot, and can be used for the production of knives, valves, shafts and various other articles of manufacture.

1,267,845. May 28, 1918. **Tube-Bending Machine.** W. H. Bush, of Waterbury, Conn., assignor to Waterbury Manufacturing Company, Waterbury, Conn.

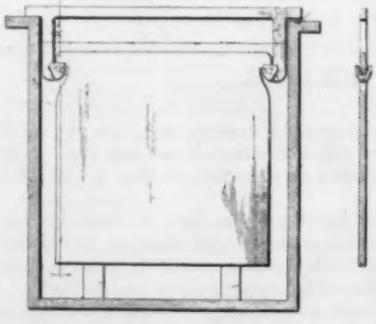
This invention relates to a tube-bending machine of simple construction and automatic in action, as shown in the cut. The patent covers:

A tube-bending machine having two bending-heads, automatic means of moving both of the said heads toward and away from each other, means for turning them simultaneously when in their closed positions, a mandrel carrier supporting a mandrel, and means for automatically operating the said mandrel-carrier intermittently, whereby one end of the tube to be bent is positioned and held at rest between the said heads when the same are in their open positions, after which the heads are closed upon the tube, which is then bent by the rotation of the heads which then separate to release the bent tube and permit the mandrel-carrier to move to present another tube.



1,267,653. May 28, 1918. **Anode-Connector.** J. H. Gilles, Toronto, Canada, assignor to British American Nickel Corporation, Ltd., of Toronto, Ontario, Canada.

The object of this invention is to provide an improved connecting device for anodes, the same being particularly useful in conjunction with the electrolytic refining of metals or alloys.

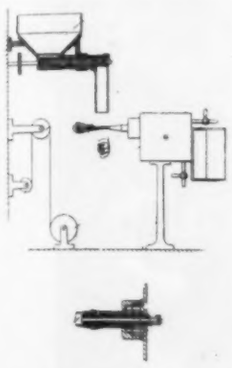


The inventor has discovered that by constructing the anode connectors of aluminum, as shown in cut, most or all of the difficulties usually encountered may be avoided. He uses these aluminum connectors in electrolytes, for example sulfate or sulfuric acid or other appropriate solutions, capable of forming by anode action a practically non-conductive surface film upon the aluminum, or of conserving such a film after its formation. The invention is therefore based on the known fact that aluminum, when made the anode in a suit-

able electrolyte, has the peculiar property of protecting itself with a thin coating of hydrate, basic sulfate, phosphate or other compound, according to the electrolyte used, this deposit not only preventing further solution of the metal, but also insulating the metal from the solution and thereby preventing the flows of the electric current from the connector or hanger to the adjacent portions of the cathode.

1,268,030. May 28, 1918. **Coating Process.** James P. A. McCoy, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company, of the same place.

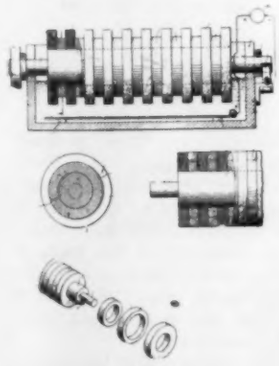
This invention relates to processes of covering solid bodies with metallic or non-metallic coatings, and it has for its object to provide a coating process as shown in the cut, in which the coating material is delivered upon the surface of the article to be coated in the form of a fine spray of molten material, the particles composing the spray being so small that the material solidifies instantly upon reaching the surface of the article to be coated.



The invention may be considered as an extension of, and an improvement upon, the well-known Schoop metallizing process, according to one modification of which a bath of molten metal is disintegrated by a rapid current of compressed and heated gas, the resulting spray being delivered by the current of gas to the cold surface of the article to be coated. According to another modification of the Schoop process, a wire of the metal to be used as the coating is fed into the flame of an oxyhydrogen or oxyacetylene torch, which melts the end of the wire and projects the resulting spray of molten metal against the article to be coated, as in the first modification of the process.

1,268,465. June 4, 1918. **Process and Apparatus for Electro-deposition.** Nathaniel Huggins, of New York, N. Y. Assignor to Copper Products Company, a corporation of Maine.

The object of this invention is to provide a new, simple and exceedingly cheap process, and an apparatus for carrying such process into effect, whereby metallic rings, or other small bodies may be cheaply formed by electro-deposition; and while especially adapted for use in forming the driving-band of soft copper, etc., for use on artillery projectiles to take the rifling of the cannon-bore, the inventor does not limit himself to any particular shape or contour of the article produced by the improved process, and apparatus.



Broadly, the improved process, as shown in cut, consists in substance in the forming and securing to a suitable conducting-cathode usually of brass, of a body or bodies of softer and usually more easily fusible metal or material, of high electric conductivity; which body or bodies are designated as conducting-mold-blanks; which mold-blanks are placed within a mold of non-conducting and insulating material of the shape and contour of the article to be electrolytically produced; immersing such mould, etc., in an electrolytic-bath and by electric-deposition forming the article in such mold; removing the article and conducting-mold-blank from the bath and cathode; and lastly removing the conducting-mold-blank from the article either by swaging, or by melting off, or fusing, or in any other desired manner.

1,268,495. June 4, 1918. **Metal Composition.** H. K. Sandell, Chicago, Ill., assignor to Herbert S. Mills of the same place.

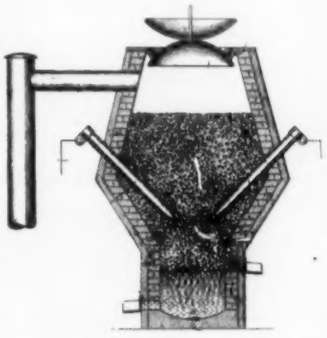
This invention relates to improvements in metal compositions. More particularly the invention is concerned with a metallic alloy comprising nickel and tungsten and containing a considerable percentage of carbon.

The metals to be alloyed, *i. e.*, nickel and tungsten, each of which should be in a relatively pure state for the best results, are introduced into the crucible and the latter raised to such a temperature as to cause them to fuse. Powdered amorphous carbon, or powdered graphitic carbon is then introduced into the fused mass, the mass being preferably stirred with a carbon stirring-rod. It is also of advantage to interrupt the current through the crucible at intervals. Within a very few minutes the molten mass within the crucible solidifies or sets. The process is now at an end and the current may be turned off, the crucible permitted to cool and the block of metal composition removed therefrom. This block may then be machined, ground or otherwise fabricated to produce contact points or other structural elements.

1,268,849. June 11, 1918. **Process for Making Alloys of Phosphorus.** Lewis A. Jeffs, Salt Lake City, Utah.

This invention relates to a process of producing alloys of phosphorus, especially of copper and phosphorus, or cuprophos, and has for its object to provide a method which will be more expeditious and less expensive than those heretofore proposed.

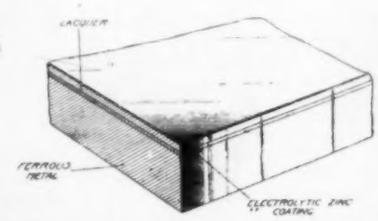
The patent covers: The process of making an alloy of a metal and phosphorus in an electric furnace as shown in cut, which consists in providing a charge of phosphate rock, fluxing material and carbon in excess; adding to said charge a material capable of supplying copper in a fused state above the fusion zone when said rock is being decomposed; passing a current of electricity through a portion of said charge to provide a localized fusion zone and of a sufficient strength to cause oxids of phosphorus to be evolved from said rock; and maintaining in said charge an excess of free incandescent carbon to reduce said oxids of phosphorus, substantially as described.



1,268,987. June 11, 1918. **Metal Coating.** Earle W. McMillen, of Kenosha, Wisconsin, assignor to Simmons Company, of Kenosha, Wisconsin.

The invention relates to improvements in metal coatings and has particular reference to an ornamental finish for steel or other ferrous metal.

The object of the invention is to provide for steel articles a practically indestructible coating, or finish, which shall possess sanitary and ornamental properties and characteristics to a high degree, while at the same time having great durability and mechanical strength and the maximum adhesive effect.



The invention briefly involves the covering of steel or other ferrous metal with an electrolytic deposit of zinc and subsequently applying, by spraying or otherwise, to the top of said coating a finishing coat of tough lacquer or analogous material.

The drawing shows a piece of ferrous metal coated according to the process.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

LEAD CABLE COVERING PRESS

A press for covering electric conduits and cables with lead has been placed on the market by the Southwark Foundry and Machine Co., Philadelphia, Pa. The press has been designed by R. Poliakoff.

Fig. 1 shows the general view of the press and Fig. 11 is the section on XY.

The cable to be covered with lead is fed into the press through the roller guides of the curved canal A, the radius of which is sufficiently large to prevent danger of impairing the pliability of the cable when passing through or distorting it. The cable next passes through bushing B and comes into contact with the molten lead, which fills the ring space between this bushing and die C through which the cable is drawn after being covered with lead. After passing through the die, the cable, completely finished, comes out with the surface of the lead smoothed out and with the diameter of the lead coating reduced to exactly the required size, and is wound on a drum which serves the additional purpose of furnishing the means for drawing the cable through the machine.

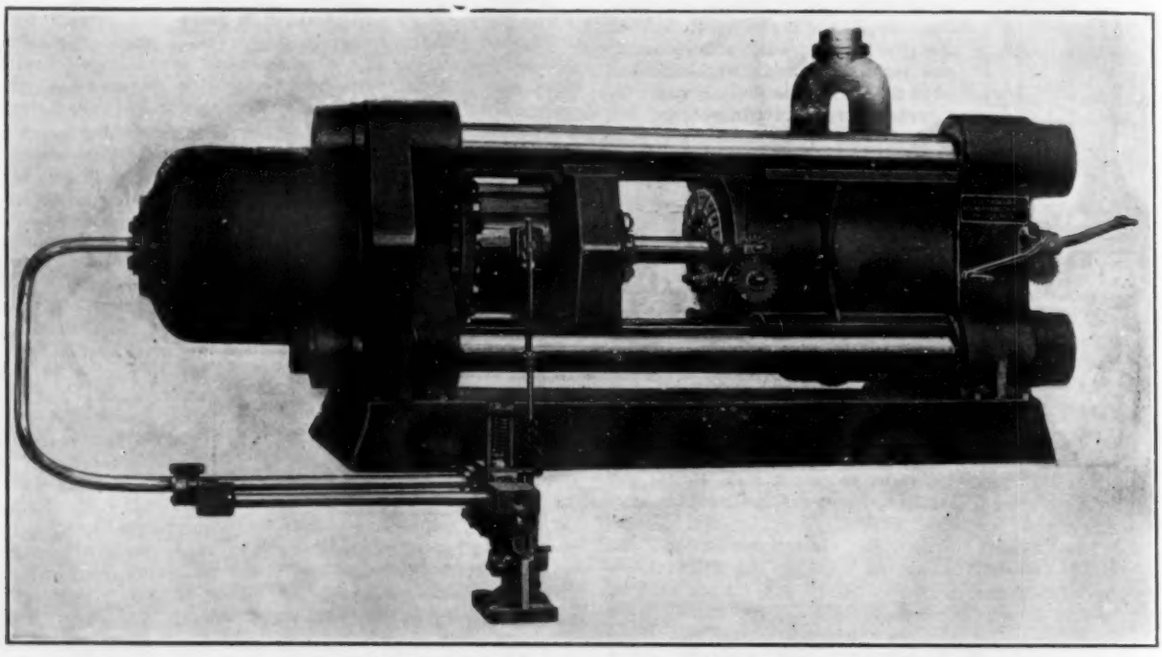


FIG. 1.—THE LEAD CABLE-COVERING PRESS MADE BY THE SOUTHWARK FOUNDRY AND MACHINE COMPANY, PHILADELPHIA, PA.

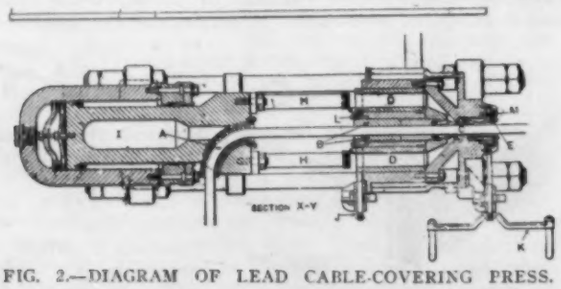


FIG. 2.—DIAGRAM OF LEAD CABLE-COVERING PRESS.

The main parts of the mechanism of this hydraulic cable covering press are as follows:

The section of the press required for applying the lead coating is composed of two cylindrical chambers d filled with molten lead, two bushings b and e and the die c. The hydraulic part of the press is intended to keep the molten lead in chambers d under a definite pressure. Lead is melted in a pot located above the press and delivered into chambers d through a pipe f. In order to insure a uniform delivery of lead into chambers d, the chambers are connected with the lead melting kettle through elbow and pipe in such a manner that melted lead can be put into the chambers at any moment. The kettle is situated above the chambers. From the chambers d the molten lead comes into contact with the cable through a ring-shaped space between bushing b and die c; by moving bushing b backward or forward, it is possible to adjust the size of the ring opening and so regulate the amount of cable surface that is in contact with the molten lead at any time.

The lead contained in chambers d is always under pressure applied by rods h which act as pistons in chambers d. These rods are actuated from hydraulic cylinder 1, and as the supply of lead in chambers d is reduced, rods h move to the right to maintain a uniform pressure. When the rods reach the extreme of their movement toward the right, drawing of the cable is stopped and rods h are moved back to their original position by shifting the operating valve of the hydraulic press; chambers d are then refilled with molten lead from the melting pot, after which the drawing of the cable can be continued.

As the parts of the press coming into contact with the molten lead will wear out faster than others, they naturally have to be adjusted or repaired from time to time. To facilitate this work, the press is built in such a way that these parts can be easily removed. Bushings b and e are each made of several pieces screwed one into the other, after which the bushings are screwed into the press. Provision is made for taking out bushings b and e by simply giving a few turns to levers j and k, respectively. Turning of either of these levers transmits motion through a train of gears to a worm gear l or m, as the case may be, these wormgears being set on the bushings to provide for withdrawing them from their respective positions. By this means, the bushings can be very easily removed.

POWER OPERATED ELECTRICAL INSTRUMENTS FOR MEASURING AND CONTROLLING TEMPERATURES

In the heat treatment of metals, it is becoming more and more the practice to bring the leads from thermocouples in different parts of the furnace and in different furnaces to a central control station. That is facilitated by the introduction of base metal thermocouples, which permits of the prolongation of the couple itself to the measuring instrument, where the effects of temperature upon the cold end of the couple are readily compensated for, and by the adoption of the potentionmeter method

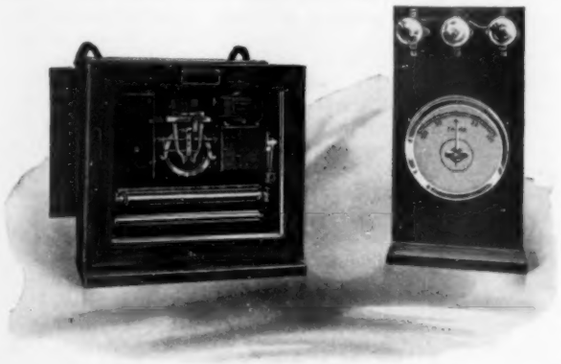


FIG. 1.—AUTOMATIC CONTROLLING RECORDER WITH FURNACE INDICATOR AND LAMPS.

of measurement, with which differences in resistance of lead wires become immaterial. An attendant at the control station uses an indicating instrument, which he connects successively to different thermocouples. Usually he is also provided with switches, by means of which he can light signal lamps for the guidance of the operators at the furnaces, usually a red light to indicate too high a temperature, a blue one to indicate too low a temperature and a white one to indicate the right temperature. A muliple-point recorder is generally installed to record the different temperatures automatically, one after the other. The Leeds & Northrup Multiple Recording Instruments, for example, are built for as many as 16 different circuits.

Where it is preferred to have the signaling at the furnace

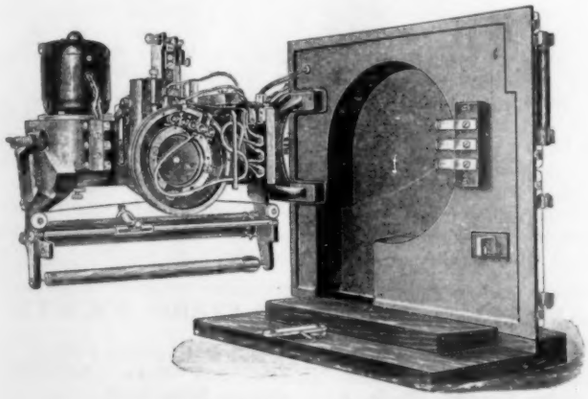


FIG. 2.—CURVE-DRAWING RECORDER OPENED FOR EXAMINATION.

done automatically, a Leeds & Northrup "single-point" or curve-drawing recorder, shown in Figs. 1 and 2, is provided with contacts on the moving element by means of which the signal lamps will be lit, accordingly as the temperatures in the furnace are too high, too low or correct. An interesting extension of this plan is to use two thermocouples in different parts of the furnace and to provide the recorder with a commutator by means of which it reads first on one and then on the other. The chart produced is a single line running alternatively back and forth between the two temperatures and indicating the temperature difference graphically; at the same time the commutator controls a fourth signal lamp at the furnace to show which thermocouple is being measured.

The double recorder is thus suitable for demonstrating uniformity of furnace temperatures, or the lack of it. It shows graphically the effects of empty furnace, full furnace, or part full furnace, and how distribution of heat is affected by rates of firing, location of load, door and other losses, cold hearth, etc. It is a convenient means for investigating furnaces and showing how errors may be overcome by moving burners, baffles, or arches, or changing the method of introducing heat, as by the use of side burners, underfiring, overfiring, number of burners, position of doors, etc. It also shows definitely the effects of location of thermocouples, how the readings vary according to their placing with respect to the work and the burners, also the number of couples to be used in a given furnace, etc.

The use of this double recorder has exploded the old "soaking heat" idea, since it demonstrates that it is practically impossible to bring many kinds of loads up uniformly to the desired temperature by holding the furnace at a "constant" temperature, without underheating some parts, and overheating others. This type of equipment has been found of especial value in studying the heating of different kinds and sizes of sections or numbers of pieces, different method of loading, speed of loading and unloading mechanical furnacing, the heat treatment of large single pieces, such as gun forgings, etc.

PLEASING NEWS FROM THE EAST

By Elmer R. Murphey, President, James H. Rhodes & Co., New York

Keep your temper, gentle sir,
Writes the manufacturer,
Though your goods are overdue,
For a month or maybe two,
We can't help it, please don't swear,
Sugar's scarce and extract rare,
Can't get metals, can't get dies,
These are facts—we tell no lies.
Harry's drafted, so is Bill,
All your work is now up hill,
So your order, we're afraid,
May be still a bit delayed.
Still you'll get it, don't be vexed,
Maybe this week—maybe next.
Keep on hoping, don't say die,
You will get it bye and bye.

Through my connection as special agent in Chicago for the War Trade Board, I have had occasion to be in Washington many times since the beginning of the War. One of the most painful and disquieting features to a business man during the earlier days of our preparation was the utter confusion of purpose that prevailed. We had committees and boards galore. They were housed in buildings widely distant from one another, making co-operation difficult. Their lines of authority and jurisdiction were more or less obscure. Out of their anxiety to serve the cause they trod upon each other's toes. To the orderly business man it was confusion worse confunded. That we did not co-ordinate and progressed but slowly during this period was inevitable. Happily for us a chance has come. Order has come out of disorder. Boards have got down to business.

Down by the Potomac River near the Speedway Part have been erected from eight to ten tremendous buildings in which are housed the Fuel Administration, Mr. Baruch's War Industries Board, the War Trade Board, part of the Quartermaster's Division, and Hoover's Food Administration, etc. These are temporary structures with plaster exteriors and beaver board partitions, each a block square. They are equipped with sprinkler systems, however, and steam heat for winter. Nothing has been done, however, to relieve the moist and uncomfortable heat of a Washington summer.

Speaking from the standpoint of one who has been in Washington many times since the beginning of the war,

there is an impression today that things are going very much better. There is no longer the flurry and excitement which attended the straightening out of the organization. People know what they want to accomplish and are going about it. In talking with several important men, whose names cannot be quoted, it is anticipated that most radical rules relative to the continuation of business rules that will tend to eliminate non-essential industries will be put in force. This will probably be accomplished, first, by taking away coal; second, by taking away help; third, by taking away facilities for shipping, in the way of depriving them of empty cars.

Presumably these rulings will come by way of the different War Boards with the expectation, of course, of hooking up the entire economic and manufacturing forces of the U. S. A. into a solid backing for our boys at the front. "Fight or Work" is a live slogan. Those who are at the front and know best the strength of the enemy know that we have no pink tea proposition ahead of us. We need the full resources of the country to do the job up right. That it can be done is a cinch, and the sooner we *all* get on the job—the quicker will we be through with it. The bit of doggerel at the head of this article is apropos. It reflects the spirit of the times. If we can remember it next winter when deliveries are on the blink and empty cars on the siding are impossible—perhaps it will help ease the pinch.

It is up to each of us at all times to exercise patience—lots of it. But we can conserve our patience as well as our other resources. We will save lots of wear and tear on soul and body if we will let this great big fact sink down deep into our minds as certain—What your factory will need next winter—then BUY IT NOW AND PUT IT IN STOCK UNDER YOUR ROOF.

A NEW HIGH TEMPERATURE CEMENT

The Hausfeld Company, of Harrison, Ohio, manufacturers and distributors of foundry equipment, has recently placed upon the market a new cement for patching and surfacing brick linings of melting furnaces and for lining molten metal conveying ladles, for which they claim exceptional efficiency and durability. The necessity of a cement in keeping with the high quality of their non-ferrous metal melting furnace, led this company to make exhaustive search and experiments, resulting in the adoption of a cement which has been given the trade name of "Fyrite."

The manufacturers report that tests made by reliable laboratories proved the superiority of "Fyrite" in that it would withstand much higher temperatures before fusing than any of the other cements against which the tests were made. "Fyrite" did not begin to fuse until the excessive temperature of 3,002 degrees Fahr. was reached—the fusing point of a No. 26 Seger Cone; equal to 1,650 degrees Centigrade—a temperature far in excess of that required for the melting of non-ferrous metals. Comparative duration tests likewise developed the superiority of "Fyrite" over other cements. The Hausfeld Company states that it will gladly prove any of the assertions made relative to the merits of their cement. A descriptive circular may be had upon request.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN INSTITUTE OF MINING ENGINEERS—METALS DIVISION

Under date of July first the American Institute of Metals became the Institute of Metals Division of the American Institute of Mining Engineers, and to this end the dues for membership from July 1, 1918, to January 1, 1919, are now being collected by the treasurer of the American Institute of Mining Engineers. The bills of the Institute are sent out on the first of January of each year so the members of the American Institute of Metals are being charged for a half year only. The regulations regarding the program of the coming convention in Milwaukee, Wis., during the first week of October will be those of the American Institute of Metals, but after the 1918 convention the regulations of the American Institute of Mining Engineers will prevail.

AMERICAN FOUNDRYMEN'S ASSOCIATION

Secretary A. O. Backert reports:

"It has been decided to open the exhibit in the Milwaukee Auditorium at 1 p. m. Monday, October 7, and on Tuesday morning, October 8, the conventions of the various organizations will be opened formally by a joint session. Every effort will be made to convert this into a great patriotic gathering and speakers of note will be invited to deliver addresses.

"Upon adjournment of the joint session, the American Foundrymen's Association, institute of metals division of the American Institute of Mining Engineers, and the iron and steel section of the American Institute of Mining Engineers will hold their first technical session. The institute of metals division will hold one session on Tuesday, October 8; two on Wednesday, October 9, closing its meeting with one session on Thursday, October 10. The iron and steel section of the American Institute of Mining Engineers will hold two sessions on Wednesday and will close with its meeting Wednesday afternoon. The American Foundrymen's Association will hold simultaneous sessions of various sections on Wednesday and Thursday, and will adjourn after two sessions are held on Friday.

"An elaborate entertainment program will be provided by the city of Milwaukee, which will include a reception and ball on Tuesday evening, theatre party Wednesday evening, and the banquet will be held on Thursday evening. The ladies, of course, will participate in the foregoing entertainment features, and in addition there will be given an automobile ride, luncheon, card party, etc."

Exhibition manager, C. E. Hoyt makes the following announcement: "We have not announced any allotments of space yet, but hope to do so very soon. We are sending out a bulletin and with it a list of names of those who have made reservation. We are doing this much earlier than ever before for the reason that we occasionally hear rumors that this year's exhibit will not amount to much on account of conditions. The list that we will send out will contain only those names of men from whom we have received bona-fide applications for space, and will show at least four more than the total at the Atlantic City convention. This is the best record that we have ever made for the same period of time, as it was June 18 before we sent out our announcements and formal application blanks, and I am certain that it will be reassuring enough to silence all doubts.

AMERICAN ELECTRO-PLATERS' SOCIETY

New York Branch.—Meets second and fourth Fridays of each month at 32 Union Square, New York. Secretary, William Fischer, 300 St. Anns avenue, New York.

The two July meetings of this branch had an average attendance of about thirty-five members. Great enthusiasm was shown when Secretary Fischer exhibited the hundred dollar Liberty Bond that the branch had subscribed for, the members being so delighted that they began to donate for another bond of the fourth issue.

During a discussion on black finish on zinc, one of the members, Mr. Sterling, exhibited some button ornaments which had been finished in a nickel sulphate solution.

President Thomas Haddow appointed a committee to arrange for a family outing to take place the latter part of September.

REVIEW OF THE DETROIT, MICH., CONVENTION OF AMERICAN ELECTROPLATERS' SOCIETY, HELD JULY 1-3, 1918

WRITTEN FOR THE METAL INDUSTRY BY FOUNDER CHARLES H. PROCTOR.

With the singing of the "Star Spangled Banner" by the entire audience the sixth annual banquet and convention was brought to a close with the announcement of Walter Fraine, re-elected supreme president, that the convention is adjourned until the next convention which will be held in Philadelphia, Pa., the first week of July, 1919.

In many ways this convention was the most remarkable of any yet held, considering the strenuous times which we are passing through for people devoted to peace and the teachings of democracy. No convention ever held was more patriotic nor had more splendid speakers to elaborate on why we are in the war and how we can all aid in winning it for liberty and democracy than this one. The orations of Dr. N. S. Rice of the North Woodward Methodist Church and the Rev. Dr. Sykes, rector of the Episcopal Church, Grosse Joint, were splendid presentations of America's cause and her aims. Both of these men had already spent some months in France and Dr. Sykes had also been in the trenches for sometime.

After we had listened to what both gentlemen had to say, w could all realize that Sherman was right when he said "War Is Hell" and we also realize that if it is a dozen Hells we have to go through them, because beyond is the haven of human liberty more precious to the future welfare of humanity than all the sacrifices our Allies or we, as the greatest of the world's democracies, can make.

Eddie Guest, poet and author, was another splendid entertainer. He recited many of his poems to the delight of his audience. One of these poems, which have the true touch of human sympathy which makes all the world akin, is reproduced here.

HE DIED FOR THE FLAG.

He died for the Flag! How easy to say it!
Yet how can man measure that sentence or weigh it,
Or sum up the glories of earth that he tried for,
Defining exactly the splendors he died for.
He died for the Flag! Was he selfishly dreaming?
Was he eager for fortune and sordidly scheming
With greed in his heart? Was he striving for treasure
For soft days of comfort and indolent leisure?
Oh, no. He was fighting and toiling for others.
And this is his tribute—he died for his brothers.
He died for the Flag! Bravely passed from life's laughter
That children might play in some sunny hereafter,
That mothers might live in contentment and gladness,
With never a tyrant to bring them to sadness.
He died for the freedom of comrade and stranger,
For God and for country he stood to death's danger;
For sweet days of labor unmarred by oppression,
For the weak to rejoice in their right of possession,
For all that is noble, for all that is truthful
He gave up his life when his days were still youthful.
He died for the Flag! And though long you shall mourn him,
The mantle of glory shall ever adorn him.
Unstained by dishonor he went to his slumbers.
Undaunted by Hate and its power and its numbers,
He stood for man's fairest of visions and teachings,
The prayers of his mother, the old pastor's preachings,
The glory of freedom, and homes glad with laughter,
Sweet peace at the fireside for all who come after.
No selfishness marred all the splendors he tried for.
The best in life lives in the Flag that he died for.

The entertainment arranged by the ladies and gentlemen of the convention committee probably surpassed any other convention that has been held by the society. This decision appeared to be the consensus of opinion of the three hundred and more members and guests present at the convention. Sincere credit is due to Messrs. Brockway, Tompkins, Lovering, Bergin, Seeley, Ratz and Fritz of the executive convention committee for the splendid entertainments provided for the members and guests. Also much credit is due Mrs. C. C. Seeley and Mrs. C. E. Tompkins for the very able manner in which they carried out their part of the program in entertaining the ladies who were in attendance. The various committees earned the thanks of the Supreme Society as well as that of the lay members and guests and as founder of the society it gives me sincere pleasure to express similar sentiments. Surely Detroit does know how to do things and also do them well.

The papers presented at the various sessions were many and varied in their topics and all were valuable and interesting. The very spirit of patriotism seemed to permeate the atmosphere during the convention and discussions. All speakers seemed to have the same idea in mind: What can we do to aid our country in winning the war? When discussions arose covering protective deposits for preventing the corrosion of iron and steel all unanimously pledged their services for the aid of the government.

The re-election of Walter Fraine of Dayton, Ohio, for the second term as supreme president was a well earned tribute for he has certainly filled the position with splendid ability and I feel encouraged to believe that under his wise and efficient leadership the society will grow during the coming year to be a greater factor than ever before. The re-election of Oscar E. Servis, as supreme secretary and treasurer, was also a tribute to his ability and efficiency and we all feel satisfied that he is the right man in the right place, and hope that in Philadelphia, in 1919, he will have the pleasure of earning his reward in being elevated to the office of supreme president.

In the re-election of H. J. Richards as editor-in-chief of the Monthly Review, the society again demonstrated its wisdom in its selection for this important office. Mr. Richards is a devoted worker for the cause and every member of the society extends to him the best wishes for the coming fiscal year. Let all members support Mr. Richards to the utmost and show our appreciation in his selection by giving him enough articles so that he will have to double the size of the Monthly Review. I am not trying to rub it in, Mr. Richards, but these suggestions follow along the lines of your own wishes.

S. P. Gartland, first vice-president and Philip Uhl, second vice-president, are new men in supreme affairs, but the entire society extends to them the best wishes for a successful part in the new administration.

In closing my review there is one point I would like to bring out, which, I believe, will prove of value in the future presentation of papers at the conventions or in articles which are prepared for publication in the Monthly Review or even in the trade papers, that the chemical symbols given in the formulas should also be given their definition in commercial terms. The members of the American Electro Platers' Society are not all chemists, nor do they understand chemical symbols and the older men in the plating trade will possibly never take up the study of such symbols. Therefore, for their benefit as well as for the benefit of others, when authors of papers give formulas such as $Ni\ SO_4\ 7\ H_2O$ or $Mg\ SO_4\ 7\ H_2O$ I would suggest that their definition as single nickel salts and magnesium sulphate, also be given. The papers will then have more significant meaning to the listener or reader who is not versed in chemistry and will be much more appreciated and more thoroughly understood.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

Thousands of chemists from all parts of the country are planning to come to New York City to attend the various conventions to be held by chemical and technical organizations in Grand Central Palace during the week of September 23. Coincident with these meetings will be held the fourth national exposition of chemical industries which promises to be the largest and most complete exposition of these industries ever held. In order to show the strides made by the chemists of America it will be necessary to use four floors of the Palace.

While the exposition will bring manufacturers of machinery, equipment, products and supplies together with men who are using them, its chief effect will be to show the people of the country that the chemists of America have made rapid advances the past year, greater than ever before in this country's history. Much of the success of winning the present war depends upon chemicals and the chemical engineer. The convention will bring to light some of the marvelous results of recent research, and many engineers and experts who hold important positions in the advance of the chemical industry will be speakers at the various industrial conferences. The proceedings will develop matters of timely interest to the public, as well as to the assembled delegates.

The advisory committee of the exposition is composed of Charles H. Herty, chairman; Raymond F. Bacon, L. H. Backeland, Ellwood Hendrick, Henry B. Faber, Bernard C. Heese, A. D. Little, W. H. Nichols, R. P. Perry, H. C. Parmelee, G. W. Thompson, F. J. Tone, T. B. Wagner and M. C. Whitaker. Charles F. Roth and F. W. Payne are the managers. Dr. Bacon, of this committee, is new head of the Chemical Warfare Section of the National Army and a member of General Pershing's staff.

INSTITUTE OF METALS

The annual autumn meeting of the Institute of Metals will be held in London, England, on September 11, when several important papers will be presented for discussion. A ballot for the election of members was to have been held on July 17, as a result of which the membership was expected to be brought well beyond the 1,000 mark—and that within the first decade of the institute's existence. In connection with the ballot there has been prepared for circulation to possible members an attractive new membership booklet. It contains a detailed statement of the institute's varied activities, as well as numerous expressions of opinion regarding the value of the work accomplished and in progress. The latter have been contributed by many well-known engineers and metallurgists. Copies can be obtained from G. Shaw Scott, M.Sc., 36 Victoria street, London, England.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

EDWARD HALE

Edward Hale, the dean of the plating world, lives and has his place of business in Akron, Ohio. Mr. Hale is probably the oldest active plater in the country and while he does not exploit his age he is understood to be well along in the seventies.

Mr. Hale is extremely active and has been engaged in the plating trade since a young man, and while he is a plating chemist in the fullest sense of the word he cares little about expressing formula in chemical terms, when they may be expressed in plain language. He has a model plant at Akron where he has solved difficulties and due to fore-sight has maintained a good business for many years.

EDWARD HALE.

Mr. Hale is not a man who cares to speak about his success as a business man and skilled plater, but he will not hesitate at any time to impart his knowledge, which has been gained by years of experience, to those who have fallen into plating difficulties. While he is well along in years, he is still young in mind, keen in repartee and it is generally hoped will be active in solving difficulties encountered in plating for many years to come.

Ralph E. Carpenter, sales manager for the Taft-Peirce Manufacturing Company of Woonsocket, R. I., for 15 years has resigned, to become effective September 1, to accept a more important position with the Aluminum Casting Company, of Cleveland, as assistant to the president.

H. H. Reama, representative of the Oakley Chemical Company, New York, is now definitely located at the following address: 1516 Mt. Royal avenue, Baltimore, Md.

William A. Lewis, dealer in metals and alloys, has closed up his plant at Monroe and Ferry streets, Hoboken, N. J., and enlisted in the United States Navy.

DEATHS

H. R. Boissier, founder of the Boissier Electric Company, New York, died at his home in Great Neck, Long Island, July 13, in his seventy-third year.

H. R. BOISSIER.

Mr. Boissier was a pioneer in the electrical, electro-typing and electro-plating fields and he was a well known electrical expert in these industries for forty-six years. His contributions to the electrical industries were many and varied and included the first permanent public electric light exhibited in the United States and installations of extensive electrical illuminations for a number of very important occasions, such as the first electric lighting service at the inaugural ball in honor of President Garfield at Washington, D. C., in 1881.

Mr. Boissier also was an expert in the manufacture of high-grade medical batteries, such as are used by the most distinguished physicians at the present time. It is stated also that Mr. Boissier was one of the first, if not the first, to produce in the United States a low-voltage electro-plating and electro-typing dynamo, which then required a stream of water running through a jacket for cooling purposes and which he developed as time passed into the well-known "World" dynamos, now on the market.

Mr. Boissier, having practically retired from business over a year ago, left a capable staff of experts, so that the conduct and operation of the business will continue along the same lines as before, although, of course, the personal loss felt by associates will be great.

Dr. Edgar Marburg, secretary-treasurer of the American Society for Testing Materials, and professor of Civil Engineering in the University of Pennsylvania, died June 27, 1918, the news of his death being received during the twenty-first meeting of the society.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

BRIDGEPORT, CONN.

AUGUST 5, 1918.

HOW THE LABOR SITUATION WAS HANDLED.

Labor troubles, which have been stirring vaguely in Bridgeport all during the present year, finally crystallized in May when a committee of manufacturers, together with a committee representing the union, went to Washington to hold a meeting with Major William C. Rogers, Major James Tole and Payson Irwin, representing the Mediation Branch of the Industrial Section of the Ordnance Department.

The machinists' union put in a demand for the following rates: Toolmakers, 80 cents an hour, this including diemakers, gauge, jig, and fixture, and all specialized branches of same; machinists, 70 cents an hour. The demand was also made for the closed shop and several smaller less important requests.

Major Rogers heard the sides of both, the manufacturers offering evidence to show that the men employed in Bridgeport shops were already highly paid and that an additional increase was not fair to the manufacturers. It was agreed by both sides that the award made by Major Rogers should be retro-active from May 1.

On June 8 the award was made and is substantially as follows: Toolmakers, 78 cents; tool-room specialists, 64 cents; machinists, general all-round, 68 cents; machinists, medium and rough work, 64 cents; lathe hands, 59 cents; planer hands, 64 cents. All overtime work was ordered paid at time and a half, but all employers who had been paying double time were ordered to continue to do so. Also all men who had been receiving pay higher than the award were to continue to receive the same rate.

It looked for a short time as if the labor troubles of the city were settled, but in a short time they again broke out, the union claiming that the factories were not abiding by the award made by Major Rogers. In order to force an issue strikes were called in several of the smaller contract shops, and finally the Remington Arms employes went out on a sympathetic strike. Government agents promised an immediate investigation, with the result that the Taft-Walsh Labor Policies Board announced that it would come to the city and hear both sides of the argument.

The hearing started on Monday, July 1, with the following members of the board present: William H. Taft, F. N. Judson, L. A. Osborne, W. N. Johnson, and F. P. Walsh. Mr. Taft formally opened the meeting and then announced that press of business in Washington necessitated his absence from the hearing.

The board held meetings for several days during which time it seemed as if the main issue would be lost in the mass of evidence offered by the machinists and other metal workers, tending to show that discrimination and "black list" systems were in prevalent use in the city, greatly to the detriment of all factory workers. The board finally ordered that both sides prepare all their evidence and present it to an examiner who would be sent to the city. It also ordered that if there had been any discrimination or "black listing" previously it was to discontinue for the duration of the war.

Examiner H. S. Hannan came to the city on July 5, and was met on the very day of his arrival with a strike at the Liberty Ordnance Company, caused by a reduction in piece-work rates. This was settled, however, by the company restoring the former prices. Again the union men insisted on discrimination evidence being presented, and volumes of this matter found its way into the records of the investigation.

Finally, however, the vital question of wages was brought to the foreground. The machinists agreed to abide by the award made by Major Rogers, while other branches of the union made corresponding requests. The manufacturers immediately requested an adjournment to enable them to gather statistics to use in combatting these requests. This was agreed to by both the union and the examiner.

When the hearing reopened, W. S. Stoddard, J. H. Nelson, and J. T. O'Brien took the place of H. S. Hannan. The manufacturers presented their statistics, prepared by over 150 out-of-town workers, to this committee. They showed that the cost of living had increased in the city 61 per cent. in the last two years. Food increased 76.6; rent, 32.5; fuel and light, 39.5. In opposition to this they claimed to show that wages had increased in the factories 81 per cent. in the same length of time. Hourly wages in general had increased 78 per cent.; weekly wages of men, 78 per cent.; weekly wages of women, 87 per cent.; hours of labor in general had increased only 1.8 per cent., and hours of labor for men had increased 3.6 per cent.

They showed that at the present time 87 per cent. of the machinists and others employed in the various factories of the city were receiving as much pay as the highest 1.7 per cent. did two years ago.

The union men also had gathered statistics which were offered as evidence, showing a higher increase in the cost of living, especially the rent item. They also contested that the statistics of the manufacturers were not complete and did not show all sides of the problem. The manufacturers replied to this by exhibiting affidavits from those working on the staistics and those in charge that the figures showed as nearly as possible the exact conditions in the city.

All the evidence was filed with the War Labor Policies Board committee and was taken by them to Washington to be presented to the board itself. It has since been stated on good authority that the War Labor Policies Board will take the condition here in Bridgeport as typical of those in other war manufacturing cities and will make the award rendered here applicable to the whole country.

While the decision of the board is awaited here with anxiety, it affects about 50,000 workers, the rest of the country will undoubtedly be as much interested if it becomes generally known that the decision in the Bridgeport case will be accepted as the general decision to govern war and munitions workers throughout the country.—L. M. P.

TORRINGTON, CONN.

AUGUST 5, 1918.

The first labor trouble here in over a year developed during the past month when the employes of the tackle block and forging departments of the Union Hardware plant went on strike in an effort to enforce their demands for a flat increase in pay of 25 per cent. The strikers, about 80 in number, were engaged in making supplies for the emergency fleet. They attempted to induce the employees of the other departments of the plant to join them, but were unsuccessful. The strike came rather unexpectedly. The men of the tackle block department visited the factory officials one afternoon and asked for a flat increase. The factory officials offered to compromise by raising the men individually according to their services. This appeared satisfactory and the men returned to work. The following morning, without further discussion, they threw down their tools and walked out. The employes of the forging department followed.

The strike lasted less than a week, a compromise being effected. No disorders of any kind occurred.

It is understood that pay was increased in several departments of some of the other factories during the month to aid the employes in meeting the increased cost of living.

The organization of the Maria Seymour Brooker Memorial, Inc., a day nursery and nurses' home given by Charles F. Brooker, president of the American Brass Company in memory of his mother, was completed during the past month. At the organization meeting, Mr. Brooker announced the gift, in addition to the land and buildings to be occupied by the memorial, of an endowment fund of $150.000, consisting of $100,000 of the second issue of Liberty Loan bonds and 1,000 shares, par value $50, of the U. S. Smelting, Refining and Mining Company stock. James A. Doughty was elected president and John M. Wadhams, treasurer.

In formally presenting the memorial, Mr. Brooker said in part:

> "Having been blessed with a God-fearing and devoted mother, and knowing that whatever success my efforts have met with have been largely influenced by her precept and example, it has been my desire to do something for my native place would would perpetuate her memory and

emphasize in a practical way the spirit which animated her in her devotion to her children, all the best things in life, and the welfare of those around her.

"And so the installation of this memorial enables me to carry into practical operation two ideas which have possessed me for a long time—the first already alluded to, the other my belief that there is an opportunity to create a center for welfare work and charitable endeavor, which would make the town more desirable for everyone, because of practical work for the alleviation of suffering—assistance for those who were in need of help, temporary or otherwise, care for the little ones when circumstances surrounding them made such care almost impossible; healthy and cheerful surroundings at low cost for those whose life is devoted to caring for the sick; and space in the open air for the enjoyment of boys and girls under the best influences.

"It has seemed to me for a long time that associated, well-directed effort of this kind would make Torrington, or any other large manufacturing center, a better place to live in and a more desirable home for people to work; that such an institution, managed and cared for on conservative business lines would impress all that the more fortunate people in the community were really unselfish and cared for the welfare of others to such an extent as to contribute by their personal effort and means, to bettering conditions for those less fortunate.

"If what has been done in this instance becomes by your management, direction and personal effort a contribution to this general idea, then we may well feel satisfied that we have at least tried to do our share to prove the assertion that the Golden Rule still prevails.

"The Memorial is yours. You can make much of it for the benefit of humanity. It is placed in your hands with the firm belief that you will carry out the ideas which brought it into existence, and devote it to the best interests of the place which gave me a start in life, which is, and always will be, nearer to my heart than any other place on earth, because it is my old home."

The contract for the construction of a big plant at the north end of the borough for the Fitzgerald Manufacturing Company has been awarded to Westcott & Mapes, of New Haven. Work will be started immediately. The building will be 300 x 50 feet, two stories high, of brick construction, and it is understood that the cost will be in the neighborhood of $75,000. The Fitzgerald company is making metal products for the government.

In connection with the campaign to better the conditions among the employes of the Torrington factories, an industrial athletic league has been formed here under the direction of William E. Besse, superintendent of the Coe Brass Branch of the American Brass Company. Every factory is represented. The contests are staged at Fuessenich Park from 7:30 p. m. until dark. That the movement meets with the hearty approval of the men is indicated by the large attendance, not only as participants but also as spectators.

Torrington manufacturers in common with others throughout the state have been called upon to fill out questionnaires relating to the use of fuel. This is a preliminary step toward fuel conservation in the factories.—J. H. T.

NEW BRITAIN, CONN.

August 5, 1918.

The New Britain Machine Company, which but recently occupied a large new factory addition for the manufacture of anti-aircraft gun mounts, is now practically ready to occupy a second new plant, of similar dimensions, built several miles from the main factory and on the railroad tracks leading from this city to the main line of the New Haven road. Already large quantities of new equipment have been installed and the factory is almost ready for immediate use. The Aberthaw Construction Company of Boston was the general contractor and erected the addition in record time. The various foundries in the city, including the Eastern Malleable Iron Works and the Malleable Iron Works, are all doing a good business, but are not adding materially to their plants. There are no plating shops of any size in this city, aside from those in connection with the big concerns, and the other metal working plants, while busy, are not expanding as are the bigger concerns which are profiting by government orders.

Landers, Frary & Clark has purchased a majority of the stock of the Meriden Cutlery Company, Meriden, Conn., and will immediately begin to enlarge the plant and increase the number of employees. During the war a considerable part of this added plant will be devoted to government work. The Landers, Frary & Clark Company have a large number of government contracts, many of which are for gas defense masks, sabers, bayonets, cooking utensils, etc., and the war department has insisted on an increased production. The Meriden Cutlery Company is capitalized at $400,000, but it is understood that the stock was purchased below par, $25. One of the big assets of this concern lies in its valuable water rights. Landers, Frary & Clark have also purchased additional real estate in this city, preparatory to such times as the officials see fit to enlarge the local factories.

Other concerns booming as a result of government orders are the Stanley Works, where the cold rolled steel mill turns out vast quantities of special steel, the P. & F. Corbin factory, which in addition to its regular line of builders' hardware, is doing war work in the nature of manufacturing hand grenades. The Russell & Erwin Division of the American Hardware Corporation and the Corbin Screw Corporation, another division of the same concern, are also doing a big business. The North & Judd Manufacturing Company and the Traut & Hine Manufacturing Company, also doing war work, are as busy as the other concerns and the last-named has just opened a factory addition in Collinsville where large quantities of army clasps are manufactured.

Speaking of general business conditions, a prominent local manufacturer states that just so long as the war lasts the local factories cannot help but be kept busy with government orders. Situated as it is, right in the center of the arsenal of the nation, New Britain cannot help but receive its large share of government work. After the war a continued wave of business is to be expected because the equipment of practically all of the local factories is such that it can be immediately changed from the manufacture of articles of destruction to articles of construction which will be necessary for the rebuilding of devastated Europe. —H. R. J.

HARTFORD, CONN.

August 5, 1918.

The fact that the Pratt & Whitney Company, employing 3,500 hands, the majority of them coming in the skilled class, voluntarily put that plant on an eight-hour basis day on July 8, paying time and a half for overtime, has created some agitation in the labor market for the metal trades locally. This plant is manufacturing war supplies of various kinds, and there had been no demand on the part of the employees for this change, and it struck the trade with something of a shock. Nine hours has been the basic day. Although only three weeks have elapsed since this happened, the thousands of employees of the Colt Patent Fire Arms Manufacturing Company have already met and made formal demand upon that company for an eight-hour basis day, and other plants are expecting similar demands. The Colt employees, however, have announced they would not strike, but in case of absolute refusal on the part of the company to treat with them on the matter, they would refer the dispute to the labor board of the war department. A large supply of the arms going to the army and navy are made at this plant, and this claim is based on the assertion that they are entitled to the eight-hour day with other government workers.

The Pratt & Whitney Company have also announced this week that they have insured all employees under the group insurance plan who have been on the payroll for more than six months. Employees on the payroll more than six months, but less than a year have already received policies for $500, and those there longer than one year got policies for $1,000 straight life insurance.

The Underwood Typewriter Company has started the construction of an addition to its plant to cost $11,000 and which will be used exclusively for welfare and recreational work among the employees.—D. W. N.

PROVIDENCE, R. I.

August 5, 1918.

The metal trades continue to make industrial history, records of a year ago paling into insignificance, large though they were, when compared with the returns of today. There never were so many orders and contracts on the books and wages never were so high as now. There are few of the plants but what are working two, and in many cases, three shifts daily, but are still unable to keep caught up on their schedules.

It is certainly the hey-day of the industry, but withal labor appears to have gone "money mad" so insistent and continuous are the demands for higher pay and shorter hours. And even at the abnormal wage schedule now in vogue it is impossible to secure the necessary help to procure goods, with the result that manufacturers are sore put to maintain their working forces and the operatives are uneasy and dissatisfied with conditions and salaries.

Notwithstanding that it is estimated that the metal industries are occupying and operating more than double the capacity and facilities they commanded a year ago, there are more building and improvements under way in the extension of plants than ever before.

An important part of the rapid-fire guns now used by the American forces in France is being made in Attleboro, by the M. & S. Company. Strange as it may seem, this important part is no more and no less than a short watch chain. The pieces of the gun, of which it is a part, will not operate without these chains. The M. & S. Co. has been awarded a contract for 32,000 of these chains, made in accordance with Government requirements by automatic machinery. The stock is furnished by a Worcester firm on Government order.

Work has been started on a furnace building for the Potter & Johnson Machine Company, on Newport avenue, Pawtucket. It is to be 62 by 277 feet and about 80 feet high. It will be of brick, concrete, steel and wooden construction, with concrete foundations and a flat, tar and gravel roof, and will be used for manufacturing shells for the government. A new machine shop is also being erected for this concern in the rear of its present plant. The foundations of the new building are completed and the brick walls are now being raised. It is 486 by 170 feet, mill construction, with brick and concrete walls, concrete foundations and a saw-tooth roof. One part of it, about 170 by 65 feet, is to be two stories and the rest one story in height.

Brown & Sharpe Manufacturing Company employes, their families and friends, numbering several hundred, attended a flag raising on Saturday afternoon, July 27, at the Pleasant Valley gardens on River avenue. The plant contains about 400 gardens, which have been cultivated this summer by the employes. The programme opened at 3 o'clock with the singing of "The Star Spangled Banner," followed by recitations of "Our Flag," by Miss Alice Hitchcock, who led in the salute to the flag and pledge of allegiance and closing with "America's Creed." There was a patriotic address and singing of "America."

The Paye & Baker Manufacturing Company and the Webster Company of North Attleboro are among the jewelry concerns who have submitted bids for the manufacture of surgical instruments for the Government who have been awarded contracts by the general purchasing officers of the medical department of the army. Laurence Gardiner, secretary of the Jewelers' War Service committee, has made suggestions of a helpful nature concerning the procedure to be gone through. He says that when the jeweler has signed his contract and forwarded it to the authorities at Washington, he should apply to the medical department of the Council of National Defense for two forms.

One of these is an application for a place on the preferential list and the other for a priority certificate. When a manufacturer has been placed on the preferential list, he says, it assures him of a definite classification concerning his future requirements of fuel, materials, etc. This is used as a basis for issuing priority certificates which will assist him in securing his materials for the manufacture of articles which he is to furnish the Government.

The City Brass Foundry, 38 Allen street, Woonsocket, R. I., is being conducted by A. J. Rogers, according to his statement filed at the city clerk's office.

Arthur M. Allen, Frank W. Tillinghast and Chauncey E. Wheeler, all of this city, are the incorporators of two concerns to conduct a general machinery business under the laws of Rhode Island, under the names of the Banner Needle Company and the J. A. Lind Company. The former is capitalized at $200,000, consisting of 1,000 shares preferred at $100 each and 1,000 shares common at $100 each and the latter at $100,000 divided into common and preferred shares 500 of each at $100.

As a proof that the manufacturing jewelry business is not dead yet, comes an order to the M. S. Company, School street, Attleboro, calling for 50,000 feet of neck and watch chains, the deliveries to be made in five installments of 10,000 feet each, to be completed in five months. Another large order was placed for 172,800 spring swivels with the same concern, which within a few days has received a check well into the thousands for goods sold in Cuba. The company is developing a very large trade in South America.

The Liberty Tool and Gauge Works, designers and builders of tools, gauge and special machinery, is getting its plant under way in a factory building on Brenon street, Woonsocket. The new company is capitalized for $50,000, the officers being as follows: President, Alexander Keema, of Woonsocket; Secretary, John S. Blondin, of Woonsocket; Treasurer, Gustave A. Friedrichs, of Woonsocket; Superintendent, Adolph Kalberer, of Woonsocket.

The New England Ventilating and Heating Company, 926 Manton avenue, has completed the installation of a ventilating fan system in the autogenous welding department of the Rhode Island Welding Company, 25 Bath street.

The Anderson Sheet Metal Company, of Providence, has been incorporated by John Hyslop, of Providence, and Alexander Anderson, William McCullough and Alexander Dow, of Pawtucket. The capital stock is $100,000 divided into 1,000 shares of $100 each.

Extensive repairs are being made at the plant of the American Screw Company on Stevens street, Providence, especially in one of the company's large four story brick buildings.

The Colvin Foundry Company has commenced the erection of a one-story frame workshop and storage room on Globe street.

W. H. M.

BOSTON, MASS.

August 5, 1918.

Of particular interest to the metal industry is the report issued by the National Industrial Conference Board, 15 Beacon street, Boston, concerning the efficiency of women workers in metal trades. Summarizing the results of investigations in 131 metal trades establishments, the board says "distinctly favorable results are being obtained."

Ten thousand women are employed in the metal trades at work formerly exclusively done by men. Half of these are in munition factories. Women have demonstrated their special value in operations where rapidity and dexterity are needed. In these "they have proved themselves better workers than men," says the report. In a gear manufacturing plant, where women do sandblasting, grinding, drilling, etc., their output is from 15 to 25 per cent. higher than men. Employers generally find that women are more careful, thorough and conscientious than men and produce less spoiled work.

On work requiring a high degree of technical skill, women have *not* demonstrated an especial fitness, but this may be because of their lack of training, the investigators think.

Employers generally have accepted the policy of equal pay for women and men on similar work. In 22 per cent. of the establishments employing men and women, however, women are paid from 10 to 20 per cent. lower wages. In many plants a system of rest periods has been established. These periods average 10 minutes twice a day. The investigations showed that a more general acceptance of a rest period system would be beneficial. The attitude of women toward their work was found to be as good as or better than that of men, and in the majority of factories it was found that their attendance is just as good.

Sheet metal workers of the United States and Canada held an important trade convention at Faneuil Hall the week of August

5. After the opening addresses by Mayor Peters and prominent labor leaders the convention adjourned to permit the delegates to march from Faneuil Hall to Rowe's wharf, where they took a boat from Pemberton Inn for an excursion. The convention headquarters was at the Quincy House.

The Metal Trades Council of Greater Boston has gone on record as opposed to "learners" wage rate, which is said to exist in shipyards along the Atlantic Coast.—R. T. E.

ROCHESTER, N. Y.

August 5, 1918.

Despite the fact that it is mid-summer not a metal-using plant in Rochester has shown a sign of a let-up in the way of turning out manufactured products. Business is still running at top speed, every available man and woman is employed, and will continue to be so long as the raw material can be obtained.

The raw material proposition is the one dark spot in the industrial horizon hereabout. The unsettled railroad situation, with its still more unsettled shipping prospects, act as a sort of damper on industrial enthusiasm. Shipping facilities out of this city are notoriously bad. A few months ago there were indications of an easement, and manufacturers hoped that better conditions would soon arrive. But the hope is dead. Deliveries are fully as bad. Orders for pig metals are taken subject to from five to six months' delay. Brass materials ordered last August and shipped in September just reached a big plant in this city. Where the brass was carried to even the manufacturers do not know. Another concern, in a remote part of the United States got the brass, and in checking up its accounts discovered the surplus.

All of the Foundries, plating shops and metal-working factories are running at full speed, according to best information obtainable. None of the concerns, however, meditate enlargement or the installation of new equipment at this time.

The plant of the Forbes Brass Company was destroyed by fire on August 1, involving a loss of $20,000. The plant had been engaged in the manufacture of brass plumbing fixtures, but the market for these goods became so poor that the plant was shut down sixty days ago. The machinery in the building was valued at $4,500, and is totally ruined. Alvah Stahl, president of the company, said the plant would be rebuilt on larger and better plans.—G. B. E.

MONTREAL, CANADA

August 5, 1918.

Business conditions in the metropolis of Canada for this month in the metal lines are prosperous and there is a great demand for copper and brass goods. The manufacturers of munitions and component parts are all running to the full limit with American and British orders for shells. Quite a number have installed new machinery and additions to their present buildings.

A portion of the plant of the Lymburner Brass Company, Ltd., collapsed on Saturday, July 13, and two persons were killed. The loss in machinery and tools was very high when the third floor crashed through to the basement. The loss is estimated at $30,000. The part will be rebuilt and new tools installed at once.

The Jenkins Brothers Company, St. Remi street, and G. T. R. R. is running their large brass plant night and day to keep up with orders for its regular lines of steam brass goods and valves. It is also furnishing large contracts for marine brass goods to the different shipbuilding concerns throughout Canada, and at the present time is the largest consumer of copper, tin, zinc and lead in the country, as its average daily output of brass and bronze castings is very high, owing to the weight and quantities of them.

The Tolland Manufacturing Company, Carriere Road, is furnishing the brass and bronze castings used by the Canadian Vickers Shipbuilding Company here, and with its regular line of work is very busy.

The Industrial Specialty Manufacturing Company has been incorporated here to manufcture a line of metal goods and is capitalized at $50,000. J. W. Blair, Francis Laverty and Charles Hale are the incorporators.—P. W. B.

DETROIT, MICH.

August 5, 1918.

It is reliably reported that Detroit is now working on munition and other government contracts worth approximately $1,000,000,000. This is a big sum, but it would not be doubted if the general public could make a survey of conditions as they are today. The city is crowded with munition men, soldiers and others who have been called here within the last few months and they still are coming. Almost daily the different automobile companies are sending out great numbers of trucks overland and so extensive has become this traffic that these truck trains have been given the right of way through the city, all other traffic stopping in order that they may pass. Two hundred trucks at a time, running only a few seconds apart are compelled to remain close together, and in order not to break this line it has been found necessary to give all such trains the right of way.

The airplane industry is assuming great proportions. The Ford Motor Company, the Cadillac Motor Car Co. and the Liberty Motor Company are the principal producers of these engines, while the Fisher Body Company manufactures the other parts of the airplane in which large quantities of aluminum is used. The airplane industry in Detroit is now in full swing, and so far as this section is concerned the production is at top speed and will continue to grow heavier in the weeks to come.

Shells are being turned out in great quantities. Lack of labor hampers to some extent, but women are being employed in large numbers and production is improving. It is no uncommon sight to see at the noon hour crowds of young women in overalls rush from the shops with the men, and attack the lunchrooms and wagons in the neighborhood. One concern even had found them valuable in shoveling sad and operating wheelbarrows. They are pronounced a great success and their numbers are increasing daily.

The demand is great for women workers and the wages so good, that servants and house maids are taking up the work, and it is very difficult now to employ a young woman maid.

The Mueller Metals Company of Port Huron, Mich., a few miles from Detroit, is reported engaged on a large contract of 75 millimeter gas shells and the plant is rapidly being enlarged to meet requirements of heavy production. About 300 men are now employed and more will be taken on, it is reported, as soon as they can be worked to advantage. Women workers also are being added daily. It is said the women are much better shell inspectors than the men. About 30 or 40 women are engaged on machines. They also wear the overall bloomer type. It is said the forgings are sent to Port Huron in the rough where they are dressed and made ready for use.

It is reported that due to a recommendation of a national committee of stove manufacturers, local producers are prepared to cut down the number of sizes, patterns and styles of stoves. This will in no way affect the output but will tend, it is said, to standardize the stove manufacture and reduce the amount of ornamental trimmings in nickel and aluminum. George H. Barbour, president of the Michigan Stove Company here, is a member of the committee of ten who has this matter of conservation in hand.

The coal situation is well in hand here and it is said manufacturers will not be so handicapped for material as last year. This change of condition has all been brought about by judicious regulation. F. J. H.

CINCINNATI, OHIO

August 5, 1918.

The great activity which the requirements of the Federal Government in the matter of war materials and supplies have caused among machinery manufacturers and allied trades in and around Cincinnati continues, if anything, at a more strenuous rate than heretofore. If the volume of business being handled and on the books of various concerns can be considered as a measure of the Government's intentions, the war will continue to demand every energy of the country for some time to come. Increased facilities, naturally, have been rendered necessary in many plants, and there will probably be more building during the remainder of the year than during the first half, as many concerns have just come to the conclusion that they must have additional room

for work or restrict their output as compared with the business available. The alternative adopted has been, in many cases, the construction of additional manufacturing units, although the handicaps imposed on building by the scarcity of labor and such essential materials as steel have made it difficult to build. However, several projects of the sort indicated are under way in the Cincinnati district, and others are being discussed.

The Lodge & Shipley Company, one of the leading makers of machine tools in Cincinnati, is rushing to completion an enormous shop in which it is understood that women will be employed exclusively. The company was crowded with business when additional orders for Government work were received, and the construction of a plant which virtually doubles the company's capacity was promptly decided upon.

The John H. McGowan Company, a machinery manufacturer, is making preparations for the construction of considerable additions to its Norwood plant, while the Alvey-Ferguson Company, a metal-working concern in the Oakley district, is also planning an addition to its plant, in which women will be extensively employed.

Many smaller concerns, as well as some others of importance, are either building additions or are planning them, and by the end of the year very substantial additions to the manufacturing capacity of the machinery, tool and foundry trades will have been completed, making the Cincinnati district more prominent and important than ever in these lines.

A fire which swept the building occupied by Richter & Co., makers of brass goods, at 210 to 214 East Ninth street, on June 28, caused damage in the building totaling $50,000, including much valuable material and machinery. Fortunately, however, patterns being made by the company for the Government were saved. The Richter loss on the building was $10,000 and on material $12,000, and another concern in the same building suffered damage amounting to $15,000. The authorities instituted an investigation to determine, if possible, the exact cause of the blaze, as it was suspected that persons desirous of injuring Government work might have had something to do with it. Nothing definite of this sort has been discovered, however.

The Dayton Adding Machine & Time Clock Company, of Dayton, Ohio, has filed amended articles of incorporation increasing its capital stock from $2,000,000 to $2,500,000 for the purpose of financing increased manufacturing capacity and providing additional working capital. The company has for several years been heavily engaged in the production of goods on war orders, and has received large additional orders since the United States entered the war.

The Bowling Green Die & Tool Company has been incorporated at Bowling Green, Ohio, with a capital stock of $25,000, by P. M. Davidson, Fred W. Uhlman, L. D. Mercer and others.—K. C. C.

CLEVELAND, OHIO

AUGUST 5, 1918.

Particular interest is manifested by the metal industry here in the report of Charles A. Otis, termed the speed up chief of the Conversion section of the War Industries Board, just back from Washington. Mr. Otis has remained here only long enough to give the varied industries of this section an idea of what his division is doing, before departing for New York City to attend the conference of war supply production. He advises that co-operation between producers and the resources and conversion division are requested, so that all data pertaining to plant capacity and personal organization will be available. For a long time production of war supplies, and especially those in connection with the metal industry have been hampered because of the inadequate facilities of bringing in raw material and in transporting the finished product to shipping points. Mr. Otis states that the development to the suburban lines is being encouraged in all sections, and already a plan looking to the perfection of freight transportation on suburban lines radiating from Cleveland is under way. Requirements of the supply and purchasing departments, as far as possible, will be submitted in detail to the various industrial sections, Mr. Otis promised. Following these requests the various industries will be expected to submit at once details of what they can do, and the government passing upon this data will be ready to submit contracts. In this way, it is believed, much speed will develop in obtaining of orders and production and shipping them.

Women as employment managers in Cleveland and northern Ohio factories, especially those doing war work, and there are few that are not doing something along this line, will be an accomplished fact within a few weeks. Women who have been engaged in instruction work here are most acceptable to this work, and those qualifying are now taking the employment managers course given under the ordnance department through the labor relations committee of the Cleveland Chamber of Commerce. Forty women have been enrolled. They are assigned to the different industrial plants here. Among the plants thus co-operating are: The Cleveland Metal Products Company, the American Multigraph Company, the National Carbon Company, the Cleveland Hardware Company, Plant No. 2; the Osborne Manufacturing Company, the Joseph Feiss Company, the Steel Products Company. School teachers, office executives, physicians and others of high educational standing are taking the course. Students are coming for this work from Ohio, New York, Connecticut, Illinois, Pennsylvania, Michigan, Massachusetts, Minnesota and New Jersey. Permanent positions with the government are expected to follow completion of the course. The large number of girls and women who have entered the metal industry, doing the work of men, makes such qualified executives necessary, it is explained at the Chamber labor bureau.

Aluminum and allied metal interests of northern Ohio are somewhat confused over the recent order from Washington, ordering the air craft board offices, established here last February, back to Washington. Lieut. Col. G. W. Mixter sent the order. He is chief of the production board at Washington. According to F. L. Lawrence, plane and engine inspector in charge of the Cleveland headquarters of the production board the maintenance of the office here necessitated extra work in keeping duplicate records for government headquarters at the capital. Offices will be continued here in the Union Building for the Cleveland branch of the Dayton headquarters in section board.

Expansion in the metal industry continues. Many large plants are adding to their space, in order that production may be further facilitated. Large acreage in Euclid Village, to the east of the city has been acquired by the Bishop-Babcock-Becker Company, upon which it will erect a group of factory buildings. The Cleveland Smelting and Refining Company has started the construction of buildings on land lately purchased in the south eastern section of the city. This concern was organized some time ago by E. A. Stotter, formerly of the Lake Erie Smelting and Refining Company. The first building to be completed will be a storage house at a cost of $20,000. Three others buildings will be erected later. These will house the refining room, the copper room and the blast furnace. The property is served by an industrial spur from the Erie Railroad.

Property has been taken by the Metal Shop Manufacturing Company on Broadway, East Side, where 16,000 additional space is available for manufacturing purposes. The Gordon Propeller and Manufacturing Company also has acquired additional East Side property for building purposes later. The Buckeye Brass and Foundry Company is preparing to build a one story brass foundry in the south eastern part of the city.

Office employes of two plants of the Cleveland Metal Products Company held their third annual picnic at Willoughbeach Park this week. Transportation by four cars, chartered by the company, was free to the members, as were refreshments. This is the third annual affair of its kind, and since the first one the office staff has increased 400 per cent.—C. C. C.

MILWAUKEE, WIS.

AUGUST 5, 1918.

Milwaukee's metal industries are enjoying an unprecedented wave of prosperity, hampered only by a serious shortage of labor, such as is said to be prevalent in all sections of the country.

Relief from this dearth of workers now looms up as imminent, however, following an announcement by the government that it

will assume sole control of labor within a few weeks, in an effort to permanently solve the problem.

A. T. Van Scoy, secretary of the International Harvester Company, and August H. Vogel, chairman of the War Industries Board for this district, have returned from the national capital, where they conferred with the War Labor Policies Board over creating a Wisconsin state bureau. Upon their return to this city they immediately set out to perfect an organization which is designed to successfully cope with the abnormal labor situation.

In the meantime industry is making the best of conditions as they are. Practically all industries have united their efforts to keep transient labor in this city. Full-page advertisements have been inserted in all newspapers, weekly, pointing out to the workers that by remaining on their benches instead of shifting about they will be conferring benefits not only upon themselves but on the nation.

The Wisconsin Gun Company has begun work on a 100 per cent. addition to its ordnance plant. The company was organized shortly after the United States entered the war upon instigation of the government. The plant program calls for a daily output of six French seventy-five millimeter guns. The addition will be 130 feet in width and 275 feet in length. The policy of the company is to employ American citizens only. Many women occupy men's posts at the lathes.

Gueder, Paeschke and Frey, enamel ware manufacturers and stampers, recently announced plans for a spacious addition to their plants. The National Enameling and Stamping Company reports a record business at its Milwaukee shops.

R. W. Fairburn, secretary of the Milwaukee Metal Trades and Founders' Association, reports that none of the foundries here are wanting for business.

The city is looking forward to the Allied Metal Trade Congress' convention, which is scheduled to be held here for the entire week of October 7. It has been estimated that at least 4,000 will attend.

The convention will mark an important event in the metal industry, according to those in charge. Every branch of the metal trades will be represented for the first time in their history. The congress will meet in the Milwaukee Auditorium, which is one of the best-equipped structures in the country to accommodate an assemblage and display of this kind. Approximately 100,000 square feet of floor space is available for the various exhibits. The cost of setting up these will mount to $125,000. Among the articles on display will be a carload of metallic war trophies captured from the German enemy at different intervals. The previous convention was held at Boston, Mass., in 1917.—J. V. L.

PHILADELPHIA, PA.

AUGUST 5, 1918.

The large call for shells, guns, and other vital products for the war program has made a large demand for machine tools in this vicinity. Many firms are taxed to capacity in turning out sufficient quantities to meet Government requirements. The labor situation, while said to be much improved over what it was last month, yet some are finding it hard to secure and hold labor. Many metal firms in this city have joined with other large plants in inserting advertisements in the daily papers urging men who are engaged in essential work to remain at their present places. One local plant that has large contracts for machine tools is the Newton Machine Tool Works, Twenty-third and Vine streets.

Plans are underway by the American Galvanizing Company, Inc., 2300 Gray's Ferry Road, for the remodeling of their three-story plant at Twenty-fifth and Morris streets.

A 100-foot brick one-story addition is planned to be built by the Southwark Bronze Company, Finance building, to its machine shop at Water and Mifflin streets.

A one-story brick and steel shop addition, 35 x 85 feet, is being planned by the National Galvanizing Company, 1609 North Front street.

Much interest was shown in the announcement that the Phosphor Bronze Smelting Company, 2200 Washington avenue, had been awarded a contract by the Navy Department for bronze wire rope. The contract amounted to $47,177.

The Bennington Foundry and Machine Company, of this city, has been incorporated with a capital stock of $100,000 by Wray C. Arnold and R. E. Meredith.

The George Oldham & Son Co., 4320 Tackawanna street, Frankford, manufacturers of machine and pneumatic tools, have filed plans for a two-story addition to their machine shop to cost $9,000.

Manufacturers of grinding wheels are well booked up on orders, and with some firms business extends far into next year.

The Abrasive Material Company, Bridesburg, Philadelphia, a large grinding wheel concern, say that coal is moving better and raw materials are coming in freely; there appears to be less difficulty in making outward-bound shipments. The labor situation is causing the most trouble and some men remain but a short time and often spoil much material.

The plating trades are busy in some quarters, although there are a few that find business quiet, and some firms are finding that nickel work is mostly being called for. The falling off in building work has caused a decline in brass plating and upon materials that are used in new buildings. They are much concerned over the announcement that the Government has planned for stove manufacturers to conserve material by eliminating all ornaments, of which the majority is nickel, from the stoves. The labor situation is bothering the trades and several recent advances in wages have been made in an effort to retain labor.—F. W. C.

TRENTON, N. J.

AUGUST 5, 1918.

While the metal industry plants of Trenton are experiencing busy times, there has been no new building or additions erected during the past few months. Only in a few instances has new machinery been installed. Of course there is a good reason for new improvements in this line. The high cost of labor and material and the high cost and scarcity of some classes of machinery tells the story.

The John A. Roebling's Sons Company, one of the largest plants in New Jersey, has added to its buildings during the past season to cope with the increased trade. The company builds its own machinery and does not have to depend on the outside market. The Roebling company is working on Government supplies, and being in the essential class is allowed material to work upon. The Trenton Brass & Machine Company, controlled by the Roebling company, is also busy on Government work. The company has ample room to turn out increased work.

When the Jordan L. Mott Company secured its first big munitions order from the Allies several years ago it equipped its big plant with special machinery and the same is now being used for United States Government work. The plant is so constructed that the working force can be increased and new machinery installed, if needed, without enlarging the works.

The Skillman Hardware Manufacturing Company is also working on Government supplies aside from its general output.

The Trenton Smelting & Refining Company has two large Trenton plants and is rushed to capacity with work. While the great war has made considerable business for the Trenton metal manufacturers the scarcity of material and help and the transportation facilities has greatly interfered with general work. One concern contemplates erecting a good sized addition when the war ends and conditions become more settled.

Hudson Shipbuilding and Repair Company, of Jersey City, has been incorporated with $100,000 capital to manufacture metals and build boats. The incorporators are W. W. Gearhart, of New York; A. G. Stewart, of Arlington, N. J., and Neta Murphy, of Ridgewood, N. J.

The Union Smelting and Refining Company, 154 St. Charles Place, Newark, N. J., contemplates building an addition to cost $18,000.

The Ferracute Machine Company, Bridgeton, N. J., manufacturers of metal-making machines, have announced a quarterly bonus to the 300 employes, and have also posted a notice that another ten per cent. increase in wages will be given shortly.

The National Metal Stamping Company will erect a one-story brick washroom at 186 Murray street, Newark, N. J., to cost $1,500.

NEW YORK, N. Y.

AUGUST 5, 1918.

METAL COMPANIES CONFISCATED.

The Alien Property Custodian authorizes the following: A. Mitchell Palmer, Alien Property Custodian, announced

Monday, July 22, that he had taken over the business of L. Vogelstein & Company, Inc., 42 Broadway, New York, and of Beer, Sondheimer & Company, Inc., 61 Broadway, New York, both of which were large German-owned metal concerns. In taking over these, and other metal businesses, the Alien Property Custodian has smashed for all time the German control of the metal industry in this country. The assets of L. Vogelstein & Company are upward of $9,000,000, and those of Beer, Sondheimer & Company, Inc., are upward of $5,000,000.

SOME OF THE COMPANY HOLDINGS.

With the American Metals Company, the large enemy interest in which has already been taken over by the Alien Property Custodian, Beer, Sondheimer & Company and L. Vogelstein & Company controlled most of the principal metal and smelting companies of this country, either by complete ownership of stock or by the ownership of enough stock to give them substantial representation on boards of directors.

Beer, Sondheimer & Company own a one-half interest in the National Zinc Company, the entire stock of the Cuba Copper Company, the Cuba Copper Leasing Company, and the Norfolk Smelting Company, and 30,000 shares of the Minerals Separation American Syndicate, Ltd.

Vogelstein & Company have large holdings in the United States Metal Refining Company and the American Zinc, Lead & Smelting Company. This latter concern controls the Wisconsin Zinc Company, American Zinc Company of Illinois, the American Zinc Company of Tennessee, the American Zinc Ore Separating Company, the American Pipe Line Company and the Oglesby Gas Company. Of the 70,000 shares of capital stock of the American Metals Company, 15,180 shares are owned by the Metallbank and M. C. of Frankfurt A/M, and 18,180 shares by the Metallsgesellschaft of the same place.

The American Metals Company completely owns the following companies: American Zinc & Chemical Company, Langeloth Coal Company, Langeloth Mercantile Company, Langeloth Townsite Company, American Metal Transport Company, Bartelsville Zinc Company, and South American Metal Company.

It had large holdings of stock in the following companies: Ohio & Colorado Smelting & Refining Company; Compania Minera de Penoles, South America; Compania de Minerales y Metals, South America; Compania Metalurgica de Torreon, South America; Compania Minera Paloma y Cabrillas, South America; Compania de Combustibbs Agujita, South America; Fundicion de Guayacan, South America; Balback Smelting & Refining Company, and Nichols Copper Company.

FIRM'S PART IN THE WAR.

From the evidence which Mr. Garvan unearthed it is apparent that L. Vogelstein and Beer, Sondheimer & Company played an important part in Germany's declaration of war, and of the continuation of the war after Germany had gotten into it. Through their domination of the metal industry in this country these concerns were enabled to send vast supplies of copper and other necessary metals to Germany.

The activities of these German concerns in supplying necessary metals to Germany seem to have continued even after the beginning of the war in August, 1914, and only came to an end when the United States joined in the European struggle.

In 1914 the profits of Beer, Sondheimer & Company were $116,624; in 1915 the profits of this concern jumped to $1,013,676; and in 1916 they reached the large total of $2,000,000. In 1917, after the United States got into the war, the profits of this company dropped to $196,900.

The profits of L. Vogelstein & Company since April, 1916, were extremely large, the firm's business for the last three years approximateing $70,000,000. Between April and December of 1916 the profits of Vogelstein & Company amounted to upward of $2,500,000.

NEW DIRECTORS APPOINTED.

To make these concerns 100 per cent American the Alien Property Custodian has appointed as directors Americans who are well known in the business and financial life of the country.

The directors named for Vogelstein & Company, are: Edward M. McIlvain, former president of the Bethlehem Steel Company; Louis A. Watres, president of the Scranton Trust Company and former lieutenant governor of Pennsylvania; James N. Wallace, president of the Central Trust Company of New York; Alfred H. Smith, president of the New York board of aldermen; C. C. Daniels, of New York City.

The Alien Property Custodian will allow Paul L. Vogelstein and Ernest Hethern to act as directors also. Isidor J. Kresel, 37 Wall Street, New York City, will act as counsel for this company.

Messrs. Wallace, McIlvain, and Watres will also act as directors of Beer, Sondheimer & Company, in addition to John P. Greer, 15 Broad Street, New York City, and Ford Huntington, 15 Dey Street, New York City. Benno Elkan and Otto Frohnknecht will act with the above directors.

Joseph F. Davies, former chairman of the Federal Trade Commission, and Isidor J. Kresel will act as counsel for this company.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Metals & Thermit Corporation, Cornelson avenue, Jersey City, N. J., has filed plans for a one-story addition on Johnston avenue, to be used for manufacturing metals and special thermits. The addition will cost about $15,000.

The Motor Metal Manufacturing Company, Detroit, Mich., has taken bids for the construction of a new one-story factory, about 65 x 220 feet, on Milford Place. The company operates a tool and grinding room, cutting-shop, stamping, soldering and japanning departments.

The General Briquetting Company, through E. F. Weeks, secretary report that they are unable to state, owing to unsettled conditions in the building trades, just when its plant at Winton Place, Cincinnati, Ohio will be completed. The company will briquette cast borings.

General Aluminum & Brass Manufacturing Company, Detroit, Mich., manufacturers of bronze bearings, die castings and aluminum and brass castings, is having plans prepared for the construction of an addition to its present plant on East Grand Boulevard, Detroit, Mich.

The Dudley Electric & Machine Company, Uniontown, Pa., has installed in its brass foundry a new Monarch tilting furnace and is prepared to furnish brass castings, rough or finished, up to 300 pounds. The company operates a brass, bronze and aluminum foundry and brass machine shop.

The Aspromet Company, manufacturers of asbestos protected metal, etc., Pittsburgh, Pa., has opened an office in the Munsey building, Washington, D. C., in charge of O. O. Robinson, district manager, and which will also be under the personal supervision of H. E. Marks, general sales manager of the company.

Geuder, Paesche & Frey, St. Paul and 15th streets, Milwaukee, Wis., is erecting a one story, 40 x 45 feet galvanizing shop, at an estimated cost of $6,000. The company also has facilities for drawing, stamping, punching, forming and pressing practically all sheet metals, such as brass, copper, sheet zinc, aluminum, etc.

The Phoenix Light Company, manufacturers of lighting fixtures, Milwaukee, Wis., has taken over the Berger Metal Manufacturing Company of New York, and with this new addition to its factory will operate a smelting and refining department, casting shop, spinning, plating, soldering, polishing and lacquering departments.

The Magnolia Metal Company, 113 Bank street, New York, announces through F. Jordan, secretary, that the published

report that its company had recently completed the erection of a smelting plant for antimony at Matawan, N. J., is incorrect. Mr. Jordan states that the Matawan smelting plant has been in operation several years.

J. W. Paxson Company, Philadelphia, Pa., are calling the attention of crucible consumers to the fact that those desiring to be sure of a supply of Japanese crucibles should place their orders promptly before stocks are exhausted, as future importations are doubtful owing to the possibility of a Government ruling against bringing in foreign crucibles.

The Mueller Metals Company, Port Huron, Mich., is building an addition to its plant which will include a second rod mill, a large tube mill and an aluminum foundry. Besides the departments already mentioned the company operates a brass and bronze foundry, brass machine shop, tool and grinding room, galvanizing, plating and polishing department.

The Crescent Brass Manufacturing Company, Cleveland, Ohio, C. H. Hofrichter, president, has purchased the three-story improved factory building, 87½ x 404 feet on Lake avenue. The company has occupied the building for some time and operates there a brass foundry, brass machine shop and spinning, plating, soldering, polishing and lacquering departments.

The National Galvanizing Company, Philadelphia, Pa., has broken ground for a one-story brick and steel shop addition, 35 x 85 feet, which will constitute the largest plant of its kind in the country. The company has moved its offices to 1615 North Front street, and galvanizing, stamping, soldering, polishing, japanning and lacquering departments are operated at its plant.

The Curtis Bay Copper & Iron Works, Curtis Bay, Md., recently incorporated with a capital stock of $1,000,000, is erecting three buildings, each 60 x 110 feet, to be used as machine shops and other works for the manufacture of copper specialties as well as ship repair parts, castings, etc. The company operates a brass and bronze foundry, brass machine shop, tool and grinding room and brazing department.

The Kenosha Die & Stamping Works, Kenosha, Wis., states that the published report that it is contemplating the erection of a new plant costing about $12,000 with equipment is not correct, but that it has secured a building which is adequate for its needs. The company operates a tool room and stamping department and intends to install japanning, plating and polishing departments in the near future.

The International Nickel Company, 43 Exchange Place, New York, has completed the construction of its new nickel and copper works at Port Colborne, Ont. Effective July 3, production work has been inaugurated. The plant will have an annual capacity of about 20,000,000 pounds of refined nickel and 12,000,000 pounds of copper, and is said to be one of the largest works of its kind in the country. It represents an investment of about $3,000,000.

Three of the largest chemical producers in this country are now under investigation by a Mitchell Palmer alien property custodian. The charge is brought against these concerns that they are or were alien owned, and at the time of going to press the investigation is still going on. These chemical companies are **Roessler and Hasslacher Chemical Company,** 100 William street, New York, **Niagara Chemical Company,** Niagara Falls, N. Y., and the **Perth Amboy Chemical Works** at Perth Amboy, N. J.

DIVIDENDS

The American Brass Company, Waterbury, Conn., has declared an extra dividend of 3½ per cent., in addition to regular quarterly dividends of 1½ per cent., both payable August 15 to holders of record July 31. The extra dividend is the same as was declared three months ago.

METAL PATRIOTISM

The Michigan Smelting & Refining Company, Detroit, Mich., has issued the following: "It is now a part of patriotism for everyone to conserve the use of Tin in every way possible. The government has requested this of all users and manufacturers of products carrying Tin content, especially in babbitt metals and solders, as it is now a well known fact that the high Tin content of these metals and many others can be greatly reduced without decreasing the efficiency or service at the same time substantially decreasing the cost. We would be pleased to advise our customers and any others interested how this can be done and must be done or the government may find it advisable to go still further in taking the situation in hand."

NEW TUBE MILL

The U. S. Copper Products Corporation, of Cleveland, Ohio, has just been organized with an authorized capital of $1,500,000. This corporation has issued a prospectus announcing that the unsold portion of the capital stock which is divided into 15,000 shares of 7 per cent. cumulative convertible preferred stock at a par value of $100 per share is now offered for subscription and the prospectus gives some pertinent facts of the establishing of the industry in Cleveland, and makes a strong argument for such a proposition. The company will manufacture seamless brass and copper tubes of all kinds, together with sheet and rod brass. The capacity of the plant at present proposed is two and one-half million pounds per month, and has been designed by Ferdinand Deming, a well-known seamless tube mill engineer, and who will superintend the construction of the mill. The executive officers of the new company are as follows: E. I. Heinsohn, president; E. S. Griffiths and Edward A. Noll, vice-presidents; John H. Price, secretary, and R. H. York, treasurer; all of Cleveland, Ohio.

COTTON BUFFS

The consumers of cotton buffs will be interested in the announcement of K. F. Griffiths & Company, 81 Fulton street, New York City, that they have entered into the manufacturing of high-grade cotton buffs used in so many factories where plating and polishing is one of the essentials. They state that they are producing a high-grade merchandise deserving of investigation by all buyers, and their well-organized factory and facilities should enable them to give the much-needed "prompt shipment."

While they have been selling buffs to the trade in considerable quantities for some time, their present capacity will permit the handling of a greater volume, and it is expected that in the near future they will become a factor of considerable importance and that the development of this new source of supply will be of value and service to a large number of buyers.

L. W. MacFarland has taken charge of this department with K. F. Griffiths & Company, and his experience of the past, which has brought him in contact with the actual users of buffs, should not only serve this company to good advantage but also be of value to the old and the new trade being developed.

War conditions have affected the buff business as all other industries have in one way or another been influenced, and the recent action of the Government in regulating the cost of cotton goods will no doubt have a most decided effect on future prices.

CHANGE IN FIRM NAME

The name of the Stewart Manufacturing Company, Chicago, Ill., manufacturers of die castings, has been changed to the **Stewart Manufacturing Corporation.** The business is now being conducted at 4535 Fullerton avenue.

The firm known as the Canadian Hoskins, Ltd., at Walkerville, Ont., Canada, will be operated under the name of **Hiram Walker & Sons Metal Products, Ltd.** The company will make nickel chrome and draw nickel chrome wire and also will manufacture electric, gas and oil furnaces, pyrometers and so forth.

INCREASE IN CAPITAL STOCK

The K. & M. Brass & Aluminum Castings Company, Cleveland, Ohio, has increased its capital stock from $10,000 to $100,000. The company operates a brass, bronze and aluminum foundry and casting shop.

The Riverside Metal Company, Riverside, N. J., manufacturers of nickel alloys, phosphor bronze and brass in sheets, rods and wire, etc., has increased its capital stock from $500,000 to $1,500,000 in order to enable it to take care of increasing business. The company operates a brass and bronze foundry and rolling mill.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To operate a galvanizing plant. The Keystone Galvanizing Company, Philadelphia, Pa. Capital $50,000. Incorporators: M. M. Pearlman, president M. M. Pearlman & Company, metal dealers, 2 Rector street, New York, and associates.

To operate a brass, bronze and aluminum foundry. The John Harsch Bronze and Foundry Company, Cleveland, Ohio. Capital $50,000. Incorporator.: John Harsch, president; H. B. Harsch, general manager; A. V. Cannon, secretary; Carl S. Fetzer, treasurer, and George H. Scott, vice-president.

PRINTED MATTER

Soldering Materials.—L. B. Allen Company, Inc., Chicago, Ill., has issued a folder describing their extensive line of Allen's non-acid soldering flux and other soldering equipment, including the new Allen gas soldering tool which is manufactured in a number of sizes.

Insulating Brick.—The Armstrong Cork Company, Pittsburgh, Pa., has published a small folder containing considerable information relating to their Nonpareil insulating brick for ovens and furnaces. This booklet states that a full size sample of Nonpareil insulating brick and further information as may be required regarding its use in furnaces and ovens will be supplied free upon request.

Rust Proofing.—The Electro Zinc Rust Proof Company, Detroit, Mich., has issued a folder in the interest of its new rust proofing process. It is stated that this process produces an absolute rust proof coating on all kinds of metals. The coat obtained by means of this equipment and solution is of uniform density and is guaranteed to stand the United States government salt spray test. It is stated that the time required to produce such a finish is only five minutes. It is also claimed that this solution is self sustaining as it is free from hydrogen gas and there is no excessive action on the anodes, therefore they need not be removed when the solution is idle. Further particulars may be obtained by corresponding with Alfred T. Wagner, 94 McDougall avenue, Detroit, Mich.

Furnaces.—The W. S. Rockwell Company, New York, has issued Bulletins Nos. 34 and 35, which are concerned with forging and heating furnaces of the economizer shield type and rolling mill type of annealing furnaces. These catalogs contain much valuable data not only with respect to the proper selection and operation of forging and rolling mill furnaces for a given kind and quantity of work, but also many worth-while pointers on such topics as the conservation of fuel, the attainment of maximum production with the minimum of labor and appliances, the safeguarding of the workmen's health and their assurance of full output under comfortable and convenient working conditions.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL STOCKS MARKET QUOTATIONS

NEW YORK, August 5, 1918.

	Par	Bid	Asked
Aluminum Company of America	$100	500	600
American Brass	100	220	225
American Hardware Corp.	100	127	130
Bristol Brass	25	40	42
Canadian Car & Foundry, com.	100	34	38
Canadian Car & Foundry, pfd.	100	85	90
Eagle Lock	25	70	75
International Silver, com.	100	35	45
International Silver, pfd.	100	..	75
New Jersey Zinc	100	220	225
Rome Brass & Copper	100	300	340
Scovill Manufacturing	100	400	425
Standard Screw, com.	100	275	285
Standard Screw, "A" pfd.	100	103	..
Yale & Towne Mfg. Co.	100	190	200

Corrected by J. K. Rice, Jr., & Co., 36 Wall street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

COPPER.

Considerable surprise was expressed in the copper industry over the result of the meeting between the War Industries Board and copper producers which was unexpectedly called on July 2, after which the announcement was made that the selling price was advanced 2.50c per lb. to 26c effective immediately and to remain in force until August 15.

Because of advanced freight rates, the serious shortage of labor and increased wage scale, the larger remunerations to refiners—whose costs also have increased—and minor causes which in the aggregate amount to a considerable addition to costs of producing copper, it is now confidently believed that there will be a further advance made in the selling price at the meeting called for August 7. The equitable adjustment of contracts made on the previous basis, 23.50c per lb. and which was understood to have been fixed and approved by the President until August 15, was a vexing problem throughout the month, no official ruling having been announced to cover them.

Exports in June, exclusive of those to Canada, were 31,791 tons, this being 10,000 tons less than in the same month last year. Total exports for first six months 1918 were 184,370 tons and compared with same period 1917 represents a decline of more than 32 per cent. Importations of ore, matte and regulus reduced to fine copper during first five months, according to official figures, were 111,500 tons.

TIN.

Scarcity of spot tin and difficulty in obtaining future shipments combined with confusion in values—Straits for importation being held at 85c, English L&F at 87c and Banca at 88c per lb.—were features early in July. No business in Chinese No. 1 was possible, notwithstanding a considerable demand which had arisen, because of the adaptability of this grade for solder. The only spot metal to be had was 99% tin in small quantities at 92-94c per pound. Late in the month official announcement was made by the British Government that no metal can now be shipped from Penang or Singapore, except by license, from the Federated Malay States. This indicates that the price of Straits or English tin is fixed and that none may be sold except at the established base, plus expenses incidental to shipment, insurance and a reasonable

percentage of profit. With this new regulation in force, two licenses are necessary in the purchase of tin, first a permit to sell giving consumer's name, and second, a license to ship after the sale is made. Spot Banca at the close was 97c per lb. and 99% tin was 95c.

Arrivals of tin in July were very satisfactory, 775 tons at Atlantic ports and 5,035 tons at Pacific ports. Domestic reduction of Bolivian ore during first five months 1918, amounted to 5,122 tons as compared with 4,849 tons in the entire year 1917.

LEAD.

Continued heavy demand for lead which could not be wholly satisfied because of pronounced scarcity of metal kept the market strong throughout July. By concerted effort of producers the price was held level at the June closing, 7.75c per lb. East St. Louis, 8.05c New York, the object being to prevent the necessity of Government action in price fixing. The expected differentials for deliveries at other points made necessary by the advance in freight rates were not yet announced. Sales were made plus the advance to destination. It is interesting to note that the advance from St. Louis to New York instead of being 25%, as expected, is more nearly 79%, the present price being 35c per cwt., as compared with 19.50c previously. Lead ore advanced from $90 to $100 per ton.

Total exports of lead during first five months 1918 were nearly 40,000 tons, including 27,802 tons of domestic origin and 12,040 tons of foreign in bond. Imports of lead during the same period were 41,518 tons.

SPELTER.

After heavy buying by the United States Government and Great Britain, that came to an end early in July, the upward movement in spelter prices was halted, and by the middle of the month, with freer offerings and only a very light demand, a decline began that resulted in a recession of .45c per lb., from 8.80-8.90c New York, 8.55-8.65c East St. Louis, at the beginning, to 8.45-8.55c New York, 8.10-8.20c East St. Louis at the close of the month. Statistics compiled by the Geological Survey show an increase in production of grade A spelter, stocks of 8,746 tons being reported on July 13. Stocks of prime Western, now listed as grade D, on the same date were 17,081 tons or exactly one-half the tonnage reported March 31. Brass special was strictly nominal at 8.37½c per lb. Grade B was 10.00-10.50c, and grade A 11.00-12.00c per lb. High grade ore remained $75 per ton and other grades ranged from $50-52 per ton for low grade to as high as $60 for intermediate grades.

Total exports of spelter in first five months 1918 amounted to 39,638 tons, including 10,362 from foreign ore and 29,276 tons from domestic ore. Imports for same period were 12,383 tons, pigs and contents of ore.

ALUMINUM.

Government prices continued unchanged during July in the aluminum market, the maximum base for 50 tons or more 98-99% being established at 33c per lb. f. o. b. producing plant. Smaller lots—15 tons to 50 tons—were 33.10c while 1 ton to 15 tons were 33.20c per lb. Enormous quantities are needed by the Government. Exports of aluminum were reported in July amounting to 1,156 tons including 855 tons to France, 253 tons to Italy and 48 tons to England.

ANTIMONY.

A moderate demand for 25 ton lots of antimony in the first half of July resulted in an advance from the June closing —13.00-13.25c per lb.—to 13.12½-13.37½c, duty paid for prompt delivery, by the middle of the month. Sales for July, August shipment from the Orient via Panama Canal were also reported at 11.75-11.87½c c. i. f. New York in bond, at intervals throughout the month. In the closing week, with slackened demand, prices for prompt antimony declined to 13.00-13.25c duty paid but futures in bond from the Orient remained firm with 12.00c asked for July, August shipments.

Production in China is reported to have increased 50%, the 1917 figures were 14,587 tons regulus, 19,823 tons crude and 3,738 tons ore amounting to 30,332 tons of metal.

SILVER.

The price of silver remained unchanged at 99⅝c per ounce during July; based upon the Government figure $1.00 for silver 1,000 fine. The ⅜c difference is accounted for by the fact that the best silver obtainable runs only 999 fine which necessitates a ⅛c per ounce deduction; transportation costs and loss of interest for the days in transit to minting points account for the further deduction.

QUICKSILVER.

The price of quicksilver in July advanced from the June closing, $118-120 per 75 lb. flask to $125-130 by the 9th, after which there was no change. The Government price is fixed at $105 per flask.

PLATINUM.

The Government price for platinum, $105 per troy ounce, was unchanged in July. Notwithstanding published articles to the contrary, an official of the War Industries Board testified before the Senate Committee that the Government has at present—July 17—an ample supply of platinum on hand; 25,000 ounces at mints and 15,000 ounces more under control.

OLD METALS.

The old metals market in July quickly responded to the 2½c per lb. advance in the Government price of copper with a rise all along the line that ranged from 10c on No. 1 pewter to 60c; 5c on block tin pipe to 75c; 3c on clean red car boxes to 22c; 2c on crucible copper and uncrucibled wire to 23.50c and 22.50c respectively; 1½c on No. 1 composition turnings to 20c and to 14.50c for heavy brass; 1¼c on light copper with fractional additions on other items. The exceptions were lead, zinc and aluminum scraps which were unchanged. Business throughout the month was steady and in satisfactory volume.

WATERBURY AVERAGE

Lake Copper. Average for 1917—30.97. 1918—January, 23.50. February, 23.50. March, 23.50. April, 23.50. May, 23.50. June, 23.50. July 26.00.

Brass Mill Spelter. Average for 1917—11.116. 1918—January, 9.60. February, 9.60. March, 9.40. April, 8.50. May, 8.95. June, 9.50. July, 10.30.

JULY MOVEMENT IN METALS

	Highest	Lowest	Average
COPPER:			
Lake	*23.50	*26.00	*25.886
Electrolytic	*23.50	*26.00	*25.886
Casting	*23.50	*26.00	*25.886
TIN	Market nominal; no metal offering		
LEAD	8.05	7.90	8.029
SPELTER (Brass special)	9.00	8.25	8.628
ANTIMONY	13.375	12.875	13.179
ALUMINUM	†33.10	†33.10	†33.10
QUICKSILVER (per flask)	$130.00	$118.00	$126.773
SILVER (cts. per oz.)	99⅝	99⅝	99⅝

*Government price. Note—The new price for copper (26.00c.), effective from July 2 to August 15, inclusive.

†Government price for carload lots, effective since June 1.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

Metal Prices, August 5, 1918

NEW METALS

COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.		
Electrolytic, carload lots, nom.	Government price.	26
Lake, carload lots, nominal...	Government price.	26
Casting, carload lots, nominal		26
TIN—Duty Free.		
Straits of Malacca, carload lots		none offered
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots		8.05
SPELTER—Duty 15%.		
Brass Special		8.50
Prime Western, carload lots		8.40
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.		
Small lots, f. o. b. factory		....
100-lb., f. o. b. factory		....
Ton lots, f. o. b. factory	Government price.	33.20
ANTIMONY—Duty 10%.		
Cookson's, Hallet's or American		Nominal
Chinese, Japanese, Wah Chang WCC, brand spot		13⅛
NICKEL—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem.		
Shot or Ingots		40 to 43c.
ELECTROLYTIC—5 cents per pound extra.		
MANGANESE METAL		Nominal
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)		$2.00
BISMUTH—Duty free		3.75
CADIUM—Duty free	nominal	1.50
CHROMIUM METAL—Duty free		.75
COBALT—97% pure		3.00
QUICKSILVER—Duty 10% per flask of 75 pounds		$130.00
PLATINUM—Duty free, per ounce		105.00
SILVER—Government assay—Duty free, per ounce		.99⅝
GOLD—Duty free, per ounce		20.67

INGOT METALS

Silicon Copper, 10%	according to quality	50	to55
Silicon Copper, 20%	" "	50	to55
Phosphor Copper, guaranteed 15%	" "	57	to62
Phosphor Copper, guaranteed 10%	" "	55	to60
Manganese Copper, 30%, 2% Iron	" "	65	to72
Phosphor Tin, guaranteed, 5%	" "	1.25	to1.30
Phosphor Tin, no guarantee	" "	1.10	to1.15
Brass Ingot, Yellow	" "	18	to20
Brass Ingot, Red	" "	26	to28
Bronze Ingot	" "	25½	to26½
Parsons Manganese Bronze Ingots	" "	30½	to32
Manganese Bronze Castings	" "	40	to50
Manganese Bronze Ingots	" "	26	to30
Phosphor Bronze	" "	24	to30
Casting Aluminum Alloys	" "	38	to39

OLD METALS

Buying Prices.		Selling Prices.
24.00	Heavy Cut Copper	25.50
24.00	Copper Wire	25.50
21.00	Light Copper	23.00
23.00	Heavy Mach. Comp	25.50
15.50	Heavy Brass	17.50
12.00	Light Brass	15.50
14.25	No. 1 Yellow Brass Turning	14.25
22.00 to 23.00	No. 1 Comp. Turnings	23.00 to 25.00
7.00	Heavy Lead	7.25
5.25	Zinc Scrap	5.70
10.00 to 13.00	Scrap Aluminum Turnings	11.00 to 14.00
19.00 to 21.50	Scrap Aluminum, cast alloyed	21.00 to 23.00
26.00 to 28.00	Scrap Aluminum, sheet (new)	28.00 to 30.00
55.00	No. 1 Pewter	60.00
22.00 to 23.00	Old Nickel anodes	25.00 to 26.00
30.00 to 32.00	Old Nickel	34.00 to 36.00

PRICES OF COPPER SHEET

Mill shipments (hot rolled).....36c. base net
From stock .....40c. base net

The following table shows the advance in cents per pound over the base price of copper sheet of various grades, lengths and widths.

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. to 32 oz.	16 oz. to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	CENTS PER LB.				CENTS PER LB. OVER BASE.				
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							
	Longer than 120 ins.	5	8							
Wider than 120 ins., but not wider than 132 ins.	Not longer than 132 ins.	6	9							
	Longer than 132 ins.	7								
Wider than 132 ins.		8								

[The insert shows the extras on copper sheets from 10, 9, 8 and less than 8 oz. in weight, and various lengths and widths.]

Width.	LENGTH.	Light than 5 oz.	8 oz.	9 oz.	10 oz.
Not wider than 30 ins.	Not longer than 72 inches.	9			
	Longer than 72 inches. Not longer than 96 inches.		6	9	
Wider than 30 ins., but not wider than 36 ins.	Not longer than 72 inches.			4½	7½
	Longer than 72 inches. Not longer than 96 inches.				6
Wider than 36 ins., but not wider than 48 ins.	Not longer than 72 inches.				3

The longest dimension in any sheet shall be considered as its length.

Metal Prices, August 5, 1918

Extras for Copper Sheets.

Circles, 8 in. diameter and larger, segments and pattern sheets, advance per pound over prices of sheet copper required to cut them from..... 3c.

Circles less than 8 in. in diameter, advance per pound over prices of sheet copper required to cut them from..... 2c.

Cold or hard rolled copper, 14 oz. per square foot and heavier, advance per pound over foregoing prices..... 1c.

Cold or hard rolled copper, lighter than 14 oz. per square foot, advance per pound over foregoing prices..... 2c.

Cold rolled annealed copper, the same price as cold rolled copper.

All polished copper, 20 in. wide and under, advance per square foot over the price of cold rolled copper..... 1c.

All polished copper, over 20 in. wide, advance per square foot over the price of cold rolled copper..... 2c.

For polishing both sides, double the above price.

The polishing extra for circles and segments to be charged on the full size of the sheet from which they are cut.

Cold rolled copper, prepared suitable for polishing, same prices and extras as polished copper.

All planished copper, advance per square foot over the prices for polished copper ..... 1c.

Tinning.

Tinning sheets on one side, all sizes, per square foot.... 5c.

For tinning both sides double the above price.

Extra for tinning or polishing circles and segments, to be charged on the full size of the sheet from which they are cut.

For tinning edges of sheets, one or both sides, prices shall be the same as for tinning all of one side of the specified sheet.

Oval Copper Bottoms.

Tinned One Side.

16 oz. to square foot and heavier, per pound.....Base
15 oz. to square foot per lb., advance over base..... ½c.
14 " " " " " " " " " .....1c.
13 " " " " " " " " " .....1½c.
12 " " " " " " " " " .....2c.
11 " " " " " " " " " .....3c.
10 " " " " " " " " " .....4c.
Lighter than 10 oz. to square foot, per pound .....7c.

Round copper bottoms, tinned one side, 8 in. **(203.2)** diameter to 17 in. **(431.8)** diameter, both inclusive, 1c. per lb. advance over ovals.

Copper circles, tinned one side, less than 8 in. **(203.2)** diameter, 3c. per lb. additional.

Copper circles, tinned one side, over 17 in. **(431.8)** diameter, not classed as copper bottoms.

Polished oval and round tinned copper bottoms, same advance as for sheets.

Copper Anodes or Battery Plates Not Larger Than 20 x 30.
⅜ in. **(9.5)** and thicker, untrimmed..... lb.
⅜ in **(9.5)** and thicker, trimmed to size..... lb.
If drilled, full weight before drilling to be charged.

Nickel-Plated Copper.

Net Cash Prices.

Sheets 14 x 48 **(355.6 x 1219.2)** inches.

	Advance over base per lb.	Plating per sheet
14 and 16 oz. and heavier, by the case of 500 pounds and over.....	6c.	40c.
14 and 16 oz. and heavier, less than one case	7c.	42c.
12 oz. and lighter, by the case.....	8c.	40c.
12 oz. and lighter, less than one case.....	9c.	42c.

Boiler Sizes.

Over 12 (.40) Oz.

By the case of 500 lbs., 7 in **(177.8)** (14 x 52) **(355.6 x 1320.8)**	6c.	45c.
By the case of 500 lbs., 8 in. **(203.2)** (14 x 56) **(355.6 x 1422.4)**	6c.	45c.
By the case of 500 lbs., 9 in. **(227.6)** (14 x 60) **(355.6 x 1523.6)**	6c.	50c.

For less quantity than one case, add 2c. per lb.; 12 oz. and lighter, add 3c. per lb.

Tinning.

For copper nickel plated on one side and tinned on the other, add for
All sizes, per square foot.....3½c.

Note.—The figures in heavy face type in all cases represent metric measurements.

BARE COPPER WIRE—CARLOAD LOTS

29c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order.....45c. per lb. base
100 lbs. to 300 lbs. in one order.....46c. " " "
Less than 100 lbs. in one order.....47½c. " " "

SEAMLESS COPPER TUBING

41 to 44c. per lb. base.

BRASS MATERIAL—MILL SHIPMENTS

In effect July 3, 1918.

To customers who buy 5,000 lbs. or more per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.30	$0.33	$0.36
Wire	.30	.34	.37
Rod	.28	.34	.37
Brazed tubing	.38	..	.44
Open seam tubing	.38	..	.44
Angles and channels	.43	..	.48

To customers who buy less than 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.31½	$0.35	$0.38
Wire	.31½	.36	.39
Rod	.30	.36	.39
Brazed tubing	.40	..	.46
Open seam tubing	.40	..	.46
Angles and channels	.45	..	.50

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

SEAMLESS BRASS TUBING

37½ to 40½c. base.

SEAMLESS BRASS TUBING—IRON PIPE SIZES

37½ to 40½c. base.

IRON LINED TUBING—NOT POLISHED

Due to fluctuations of the metal market we are unable to quote these prices.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod.....35½c. net base
Muntz or Yellow Metal Sheathing (14" x 48").32c. " "
Muntz or Yellow Metal Rectangular sheets other than Sheathing.....35c. " "
Muntz or Yellow Metal Rod.....33c. " "
Above are for 100 lbs. or more in one order.

Metal Prices, August 5, 1918

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 15c basis, less 8%

Casks, jobbers' prices....16½c.

Open casks, jobbers' prices....17c.

The above mill prices have been fixed by the United States Government, applying to civilian population of the United States and allied governments.

ALUMINUM SHEET, ROD AND WIRE

Sheet Aluminum, outside market contract base price, 42.40c. per pound.

FLAT SHEET

Gauge		Price in Cents per Lb. 1 Ton Lots	15 Ton Lots	50 Ton Lots
Nos. 18 and heavier....	3" to 60"	42.40	42.20	42.00
Nos. 19 and 20.....	3" to 60"	43.50	43.30	43.10
Nos. 21 to 24, incl...	3" to 30"	45.80	45.60	45.40
	30" to 48"	48.00	47.80	47.60
	48" to 60"	51.40	51.20	51.00
Nos. 25 and 26.....	3" to 30"	49.20	49.00	48.80
	30" to 48"	51.40	51.20	51,00
No. 27.....	3" to 30"	50.30	50.10	49.90
	30" to 48"	53.70	53.50	53.30
No. 28.....	3" to 30"	52.50	52.30	52.10
	30" to 48"	55.90	55.70	55.50
No. 29.....	3" to 30"	55.90	55.70	55.50
	30" to 48"	60.40	60.20	60.00
No. 30.....	3" to 30"	58.20	58.00	57.80

ROD.

B. & S. Gauge.

¾" to 1" Advancing by 32nds
1" to 2⅝" " " 16ths } 98% rolled, 43.10 cents per lb.
2⅝" to 3½" " " 8ths

⅜" to ¾", 98% rolled and drawn.....48.80 cents per lb.

WIRE.

Definition: Round—less than ⅜" diameter. Other shapes—less than ⅜" greatest diameter.

B. & S. Gauge.	Spools.	Price in Cents Per Lb. On Spools.	In Coils.
Nos. 2 to 10, inclusive.....	50 lb.	$.465	$.437
Nos. 11 and 12.....	50 lb.	.499	.465
Nos. 13 and 14.....	35 lb.	.533	.493
Nos. 15 and 16.....	20 lb.	.611	.549
Nos. 17 and 18.....	20 lb.	.689	.606
Nos. 19 and 20.....	10 lb.	.714	.718
No. 21.....	10 lb.	.815	.803
No. 22.....	10 lb.	1.050	.915
No. 23.....	10 lb.	1.185	1.028
No. 24.....	5 or 2 lb.	1.421	....
No. 25.....	5 or 2 lb.	1.646	....
No. 26.....	5 or 2 lb.	1.928	....
No. 27.....	1 lb.	2.321	....
No. 28.....	1 lb.	2.771	....
No. 29.....	½ lb.	3.840	....
No. 30.....	½ lb.	5.021	....

GRADE "B" NICKEL SILVER SHEET METAL

Quality.	Net per lb.	Quality.	Net per lb.
5%.....	42½c.	16%.....	47c.
8%.....	43½c.	18%.....	47½c.
10%.....	43¾c.	20%.....	49¼c.
12%.....	45½c.	25%.....	57c.
15%.....	49c.	30%.....	62½c.

NICKEL SILVER WIRE

Quality.	Net per lb.	Quality.	Net per lb.
5%.....	44c.	15%.....	52c.
8%.....	46c.	16%.....	52½c.
10%.....	48c.	18%.....	54½c.
12%.....	50c.	30%.....	70c.

The above Base Prices are subject to additions for extras as per list printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are correspondingly higher.

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over at N. Y. tin price, 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 12c. over, 25 to 50 lbs., 15c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—5.75 cents per lb.

TIN FOIL

Base price—No quotation.

PLATERS METALS

Platers' bar in the rough, 65c. net.

Nickel silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from $1.02 to $1.05 per Troy ounce, depending upon quantity.

NICKEL ANODES

85 to 87% purity.....52½c. per lb.
90 to 92% " .....55c. " "
95 to 97% " .....57½c. " "

Supply Prices, August 5, 1918

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg.	lb.	.08
Hydrochloric, C. P., 22 deg.	lb.	.16
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg.	lb.	.09¼
Nitric, 42 deg.	lb.	.11⅛
Sulphuric, 66 deg.	lb.	.08
Alcohol—		
Denatured	gal.	1.00
Alum—		
Lump	lb.	—
Powdered	lb.	—
Aluminum sulphate, iron free	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Arsenic, white	lb.	—
Argols, white, see Cream of Tartar	lb.	.80
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.15
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	—
Carbonate	lb.	.45
Cyanide	lb.	.65
Sulphate	lb.	.15
Copperas (Iron Sulphate)	lb.	.06
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.80
Crocus	lb.	.10
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	12.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.06
Lead Acetate (Sugar of Lead)	lb.	—
Yellow Oxide (Litharge)	lb.	.20
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate Dry	lb.	.80
Chloride	lb.	.70
Salts, single bbl.	lb.	.14
Salts, double bbl.	lb.	.13
Paraffin	lb.	.25
Phosphorus—Duty free, according to quality		75-100
Potash, Caustic (Potassium Hydrate)	lb.	—
Lump	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 96-98%	lb.	1.25
Cyanide, 98-99½%	lb.	—
Sulphocyanide	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	.73⅝
Rosin	lb.	.08
Rouge, nickel	lb.	.45
Silver and gold	lb.	.60
Sal Ammoniac (Ammonium Chloride)	lb.	.30
Sal Soda	lb.	.05
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	66.83
Soda Ash, 58%	lb.	.08
Sodium—		
Biborate, see Borax	lb.	.15
Bisulphite	lb.	.15
Cyanide	lb.	.37
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.10
Phosphate	lb.	.14
Silicate (Water Glass)	lb.	.05
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.35
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate	lb.	—
Water Glass, see Sodium Silicate	lb.	.05
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.35
Cyanide	lb.	.50
Sulphate	lb.	.12

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$70.20
14 " 20 " 64/68 "	"	92.50
12 " 20 " 84/92 "	"	83.55
14 " 20 " 84/92 "	"	108.35
Sewed buffs per pound.		
Bleached and unbleached	"	.60
Colored	"	.55

FELT WHEELS

White Spanish— Diameter	Thickness	Price	
6 to 20 inches, inc.	½ inch or under	$3.05	per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	2.95	"
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	2.75	"
10 to 16 inches, inc.	1 inch to 3 inches, inc.	2.65	"
18 to 20 inches, inc.	1 inch to 3 inches, inc.	2.75	"
6 to 20 inches, inc.	over 3 inches	2.75	"

Grey Mexican— Diameter	Thickness	Price	
6 to 20 inches, inc.	½ inch or under	$2.95	per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	2.85	"
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	2.65	"
10 to 16 inches, inc.	1 inch to 3 inches, inc.	2.55	"
18 to 20 inches, inc.	1 inch to 3 inches, inc.	2.65	"
6 to 20 inches, inc.	over 3 inches	2.65	"